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BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

Vol. 36.] 1939. [No. 3.

SUMMARY OF RECENT ABSTRACTS.*

III. MALARIA.

General.

JAMES (p. 255) gives a general account of the progress of malariology during the past 20 years, in connexion with malaria in man, monkeys and birds, and EDGE (p. 256) brings together the information contained in the British Colonial Medical Reports for 1935 on the prevalence of the disease.

Epidemiology.

DECOURT (p. 511) considers that, other things being equal, the severity of endemic malaria varies inversely with the density of the population affected, which explains why it is less severe in towns than rural areas, and why increase in rural population, with more intensive cultivation, tends to decrease anopheline prevalence. He discusses the cost and procedure of bonification.

STRATMAN-THOMAS *et al.* (p. 257) in Cyprus found infection with *vivax*, *falciparum* and *malariae*, but principally *vivax*. Spleen and parasite indexes were highest at altitudes of 1,000–1,500 feet, but above 2,000 feet the parasite rate was considerably higher than the spleen rate. The malaria problem of Cyprus is essentially a rural problem.

GROOTINGS (p. 902) discusses the increase in malaria which followed the improvement in housing which was undertaken as an anti-plague measure in the Dutch East Indies. Mosquitoes are more prevalent in the new houses than in the old, which may be due to a better environment for them than formerly; or the possibility that the biological equilibrium of the population has been disturbed may account for the increase of malaria; or the obvious possibility of the creation of breeding places during the construction of the houses may be the predominant factor. The procedures advised to prevent malaria arising from this necessary anti-plague house improvement will be given in the section on prevention. ROSIER (p. 417) describes how this house improvement and reconstruction for the prevention of plague in Java has led to increased malaria. The factors are engineer-

* The information from which this series of summaries has been compiled is given in the abstracts made by the Sectional Editors in the *Tropical Diseases Bulletin*, 1938, Vol. 35. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

ing works, an immigrant population, an endemic area, borrow pits and rubbish heaps.

LEGENDRE (p. 511) in Cambodia found *falciparum* and *vivax* infections occurring sporadically in the thickly populated areas on river banks. FARINAUD (p. 808) reports that malaria in the deltas and on the coast of Indo-China is much less severe than in the hyperendemic hilly interior, but that severe outbreaks may occur. A sudden increase in morbidity has been accompanied by an equally sudden increase of salt water breeding anophelines, of which the most important is *A. sundaicus*.

VICKERS and STRAHAN (p. 416) report that Alor Star in Kedah, in spite of rice cultivation, swamps and abundance of anophelines, is relatively non-malarious with spleen and parasite rates of 1·9 and 2·3. Rice cultivation in hilly areas, on the other hand, is sometimes associated with hyperendemic malaria. LEFÈBVRE (p. 809) in Laos finds malaria to be hyperendemic. The vast majority of the population are infected in early life and repeated infection leads to the immune state. Clinical manifestations are therefore uncommon and not severe. Healthy carriers abound and constitute a great danger to non-immune immigrants. MARTIAL (p. 727) in Tonking found malaria to be most prevalent near the limestone hills and most severe amongst the immigrant Annamese population. Incidence diminishes when temperature falls below 18°C., and increases when it rises above 20°C.

GENEVRAY, TOUMANOFF and HOANG-TICH-TRY (p. 808) observed in a severe epidemic in a village of Tonking that the highest spleen rate was only 24 per cent. whereas the parasite rate was 90 per cent. and the gamete rate over 80 per cent. *P. falciparum* was most in evidence.

ANDREWS and CHU (p. 509) near Shanghai found parasites in the blood of 8·0 per cent. of school-children in autumn and 1·7 per cent. in spring. In all, 7,766 bloods were examined.

SWELLENGREBEL, DE BUCK and KRAAN (p. 659) regard as good carriers those who show one parasite or more per 100 leucocytes. They investigated 31 families in North Holland and found that the proportion of good carriers was about equal in children who had and those who had not had fever that year, but that it was much higher among adults who had had fever than among those who had not. KLIGLER and MER (p. 99) point out that in the case of *P. falciparum* and *P. malariae* the most infective carrier was not necessarily the one with the greatest number of gametocytes. CLARK and KOMP (p. 806) found that a certain number of carriers were missed during surveys in an unsanitated area in Panama, and that these are enough to keep up transmission in communities where drug treatment was used and where anti-mosquito measures were impossible. Crescent carriers were more numerous in the atebrin-plasmoquine treated group than in the unsupervised controls who received only quinine, but that may have been due to heavier infections. Only 8 of 59 infants under 1 year were infected. SAUTET (p. 258) finds that adult foreigners in Corsica often play, as gamete carriers, an important part in spreading infection. Children are also such carriers. *Vivax* infections occur mainly in spring, *falciparum* in autumn and *malariae* in winter, but the latter are much less common than the two former.

SCHWETZ and GERONNEZ (p. 804) examined a large number of blood films, especially of children, in the Belgian Congo. In the intensely malarious regions infection begins a few weeks after birth,

is almost universal at 6 months and the parasite index decreases gradually after the fifth year. *Falciparum* infections are the most common, *vivax* the least and *malariae* intermediate. *Falciparum* infections can be found at all ages. In the coastal region incidence is less though the general trend resembles that described above. DUREN (p. 22) in the Belgian Congo found that the mean annual morbidity rates for Europeans fell from 220 per thousand in 1918–20 to 141 in 1931–34, and the mean mortality from 6·39 to 1·82 in the same periods. In the native population malaria causes 16·5 per cent. of deaths in the age group 0–3 years. At high altitudes where malaria is only mildly endemic, serious epidemics, with severe and fatal cases of haemoglobinuria, occur, for example in Ruanda Urundi.

LEGA, RAFFAELE and CANALIS (p. 509) in Italian East Africa found that malaria was very prevalent at altitudes of 1,000 to 1,200 metres, with spleen rates up to 90 per cent. *Falciparum* infections were the most common. In the plains incidence was lower but still great, with predominance of *vivax* infections. MIRA (p. 810) found in the inhabitants of part of Abyssinia spleen indexes from 4 to 33 per cent. and parasite indexes from 10 to 12. *Vivax* infection was commoner than *falciparum*. PIETRO (p. 510) in Eritrea found three-quarters of the malaria to be due to *falciparum*, the remainder to mixed *falciparum* and *vivax* infections. Abnormal Nile floods probably accounted for the increased prevalence in Egypt in 1935 (p. 96).

ROOT and ANDREWS (p. 805) in Grenada found that the spleen index alone was not a reliable index of malaria prevalence. Other causes of splenomegaly were found. The incidence of malaria is not high. [See also WILSON, this *Bulletin*, 1935, Vol. 32, p. 109.]

FAUST (p. 811) from mortality records in the Southern United States for 1936 found an increase in three States, especially the coastal regions, but a decrease in the Mississippi delta. The average mortality is higher than 10 years ago and the disease is spreading, but the factors causing this are unknown. DAUER and FAUST (p. 20) show that in the South-East United States the mortality rates in 1935 showed a tendency to decline in the worst endemic areas and to increase elsewhere. FAUST (p. 259) states that mortality data are very poor in the southern United States and pleads for greater accuracy in diagnosis, treatment and recording. Whereas it has been estimated that for each death caused by malaria there are at least 200 cases, in one State only two cases were reported for each death. This is a serious discrepancy.

Aetiology.

BOYD and KITCHEN (p. 263) found that the incubation period of *falciparum* infections transmitted by *A. quadrimaculatus* varied from 6 to 25 days and that the variations were due to the different strains used.

ALEXEIJEW and KONACHOW (p. 101) found evidence of binary fission in the female nucleus in *falciparum* crescents. CASINI (p. 27) describes senescent forms of crescents in *falciparum* infections, which have lost the power to infect anophelines. They most commonly occur in chronic cases.

RAFFAELE and LEGA (p. 418) recognize morphological characteristics which are described, justifying the appelation *P. falciparum* var. *aethiopicum* of a strain found in Italian East Africa. In this strain the

ring forms are less constantly circular, the chromatin granules coarser and pigment appears later than in typical forms. Also the crescents are shorter and broader and, especially the male gametocytes, less falciform ; flagellation occurs earlier, in 3–5 minutes as compared with 15–20 for typical strains.

Nucciotti (p. 895) notes that the designation *immaculatum* has been given to the strain of *falciparum* commonly seen in Italian East Africa. It is strictly comparable with the Italian strain from the point of view of relapse production following primary infection.

Boyd and Kitchen (p. 425) infected two patients simultaneously with *P. vivax* and *P. falciparum*. At first *falciparum* was most in evidence, with characteristic clinical features. Later *vivax* was dominant and *falciparum* decreased in numbers, suggesting antagonism, but in one case *falciparum* reappeared and both remained at a low, equal density.

Antschelewitsch (p. 38) found that blood containing parasites and mixed with various solutions containing glucose, citrate and other salts may remain infective, if used for transfusion, up to the eighth day. *Vivax* infected blood was largely used in this investigation, which is important both in the matter of transfusion and as a means of inducing therapeutic malaria.

Ivanić (p. 101) describes stages in the nuclear division of *P. vivax* which take place by a process of mitosis.

Boyd and Kitchen (p. 261) think that the frequency of renewed clinical activity after the cessation of the primary attack varies with different *vivax* strains. They worked with the McCoy strain.

Friedmann (p. 100) found certain changes in *P. vivax* examined in dry blood films stained by various Romanowsky methods, which produced resemblances to *P. ovale*, *P. camarense* and parasites of monkeys. Hauer (p. 101) found that a strain of *P. ovale*, during the course of repeated passages, showed a tendency to assume characters of both *P. vivax* and *P. malariae*, but does not consider that it is merely a variety of *P. vivax*. Eskin (p. 814) describes a case of infection with *P. ovale* in Russia, the first contracted in Europe to be reported. *Vivax* infection was also present but the two could easily be distinguished, and in five successive passages through G.P.I. patients *P. ovale* could be seen. The diagnosis was confirmed by Wenyon and Hoare.

Ciuca *et al.* (p. 428) record that 79·8 per cent. of 158 general paralytics were successfully infected with *P. knowlesi*. The illness produced was usually mild, but Ballif *et al.* (p. 429) show that immunity against reinfection was absolute. Patients treated by *vivax* infection were completely resistant to *vivax* and partially so to *knowlesi*. The authors therefore postulate both common and specific antigenic factors.

Barber and Rice (p. 724) in Poona found the following percentages of splenomegaly in children harbouring the parasites named—*vivax* 57, *falciparum* 66, *malariae* 84 and mixed 100.

[A table showing the proportions of infection by the three principal plasmodia was constructed from the abstracts giving such information, but was considered to be too incomplete to be useful. Readers are referred to the original abstracts on this subject.]

Transmission.

Beklemischev and Zhelochovtsev (p. 661) have found *A. maculipennis* as far north as lat. 66°N. Its southern extension in Asia and Africa is determined by the heat of the summer. Pokrovski

and POLIKARPOVA (p. 194) found that *A. maculipennis* is transported into cities on steamers on the Volga, and consider that this fact undoubtedly has epidemiological significance.

In Normandy, as a result of the study of the eggs of *A. maculipennis*, ROUBAUD *et al.* (p. 571) consider that crossing has taken place between *typicus* and *atroparvus*. This has hitherto been supposed to be impossible.

MOSNA (p. 189) records investigations into rate of development of two races of *A. maculipennis*, *labranchiae* and *atroparvus* under controlled conditions of temperature. SAUTET (p. 192) found that both *A. maculipennis labranchiae* and *A. elutus* in the hot weather in Corsica show a preference for outdoor existence, and believes that malaria is contracted in the open air more commonly than is generally supposed. POLEZHAEV (p. 190) shows that the average numbers of *A. maculipennis* seen varied indirectly with the intensity of light in the cowsheds and stables examined. CORRADETTI (p. 426) investigated the food preferences of the races of *A. maculipennis*. KOSTITCH (p. 194) in Jugoslavia found that *A. maculipennis* var. *messeae* never exhibits the leanings towards exclusive zoophilism which it does in other parts of Europe. RICE and BARBER (p. 39) in Macedonia found that *A. maculipennis* and *A. superpictus* are attracted to domestic animals, whereas *A. elutus* is indifferent as regards choice of human or domestic animal sources of blood. Sporozoite indexes were *elutus* 7·7, *maculipennis* 0·3 when the two species were collected on the same day in the same house or stable.

SWELLENGREBEL, DE BUCK and KRAAN (p. 425) in North Holland found that the natural rate of infection of *A. maculipennis atroparvus* is 118 times higher than that of *messeae*. In autumn the Anopheles spread malaria from man to man and the parasites are kept alive in man until the next transmitting season.

PAPADAKIS (p. 195) investigated the biology of *A. superpictus* in Greece, and (p. 196) describes its breeding in warm, shallow, sunlit collections of water. STRATMAN-THOMAS, BARBER and CARTER (p. 257) in Cyprus found infected *superpictus* in March, probably surviving in overwintering females. The bulk of transmission takes place from June to September but some occurs in autumn. Winter transmission probably does not take place.

KLIGLER and MER (p. 99) experimenting with *A. elutus* found that it was most susceptible to infection with *P. vivax* and least to *P. falciparum*, though development was slowest in the case of *P. malariae*. Atebrin, like quinine, does not deprive crescents of their capacity to develop in mosquitoes.

DE BUCK (p. 663) details observations on the secretions of the salivary glands and stomachs of *A. maculipennis*, *Th. annulata* and *C. pipiens*.

DE MEILLON (p. 194) has been successful in maintaining *A. gambiae* in culture in the laboratory by using a large cage heated to 25°C. and offering a small pig as food. He has (p. 662) found evidence to suggest that providing *A. gambiae* can obtain blood every night, it can survive continuous exposure to very low humidity (20 per cent. at 26°C.). The same author (p. 662) in Northern Rhodesia found that *A. funestus* may fly up to 2·8 miles down wind. The breeding habits of *A. gambiae* and *A. funestus* are constant in different parts of Africa. GEBERT (p. 193) in Mauritius found that to destroy the eggs of *A.*

gambiae in tanks, etc., in gardens, the common practice of emptying them for a few hours is insufficient. A period of 4 days is necessary.

Experiments were conducted in Bengal (p. 39) to discover why *A. culicifacies*, the chief vector elsewhere in India, is relatively a failure as a vector in Bengal. It was found that breeding in the muddy water with aquatic vegetation usually found in Bengal was difficult. The investigation continues. SWEET (p. 95) found that *A. culicifacies*, though the most prevalent anopheline in Mysore, is not strongly attracted to human beings as a source of blood.

SWEET and RAO (p. 426) recognize two forms of *A. stephensi*—the "B" or type form, first recognized in Bangalore, apparently anthropophilic and probably the urban vector; and the "M" form, first obtained in Marikanave, apparently zoophilic and possibly the rural form and a poor vector. The authors propose for the latter the name *A. stephensi* var. *mysorensis*.

SEN (p. 189) gives the percentages of 11 species of anophelines caught in a total of 15,453 during one year in houses and cattle sheds in Bengal. For details the full table should be consulted.

LEFÈBVRE (p. 901) shows that in Laos *A. minimus* breeds particularly in moderately hilly country but is rare in flat low-lying places. It is adaptable and can breed in stagnant as well as stream waters and this adaptability probably explains why, in *minimus* areas, malaria is constantly hyperendemic. Malaria transmitted by other species in Laos tends to be seasonal. TOUMANOFF (p. 569) found sporozoites and cysts of *falciparum* in *A. minimus* persisting after several feeds on buffalo.

GASCHEN and RAYNAL (p. 192) found that *A. vagus* in Indo-China is very definitely zoophilic. In the absence of human blood, *minimus* and *jeyporiensis* feed on bovines. *A. aconitus* is markedly zoophilic but in parts of Tonking shows anthropophilic tendencies. HU and YU (p. 197) found in Shanghai that *A. sinensis* showed a marked preference for domestic animals. CHANG (p. 197) in Kao-chiao found that *A. sinensis*, though multidentate, frequently contains human blood. TOUMANOFF and HOANG-TICH-TRY (p. 660) explain the anophelism without malaria found in the health resort of Chapa, Tonking, by the zoophilic tendencies of the anophelines.

TOUMANOFF (p. 661) shows that rainfall is more important than other meteorological factors in determining the seasonal prevalence of anophelines in Indo-China.

GENEVRAY *et al.* (p. 809) in Tonking found that old borrow pits made during the construction of a bund were the most important anopheline breeding places. There had been a severe epidemic of malaria in Ha-tri, a village in the Tonking delta. Precipitin tests carried out on engorged mosquitoes showed that 41 per cent. of *aconitus* and 35 per cent. of *hyrcanus* caught in human dwellings had fed on man, and the small number of cattle had intensified the anthropophilism of the insects, which were breeding in large numbers.

BOYD, KITCHEN and KUPPER (p. 424) found that *A. quadrimaculatus* can be simultaneously infected with *vivax* and *falciparum* and can transmit both. ROZEBOOM (p. 807) found in Panama that *A. albitarsis* is refractory to local *P. falciparum*, in contrast to the susceptibility of the Brazilian *albitarsis* to the Brazilian *falciparum*. The control of malaria still depends on the control of the only really dangerous vector, *albimanus*. BOYD, CARR and ROZEBOOM (p. 659) as a result of experiments in the infection of Anopheles, consider that West Indian

strains of *vivax* and *falciparum* might spread if introduced into the south-eastern United States but that the United States strains would only spread to a limited extent, if at all, if introduced into Cuba or Panama.

Boyd and Kitchen (p. 195), experimenting with anophelines, found that if the stomach wall is heavily occupied by *falciparum* cysts, the mosquito will not mature as many infectious sporozoites as will a lightly infected mosquito. This is not the case with *vivax*.

Williamson and Zain (p. 198) found that the developmental cycle of the two common malaria parasites, and probably of quartan also, can proceed to completion in *Culex bitaeniorhyncus*, but in the absence of proof of transmission, no epidemiological conclusion is at present warranted.

[An attempt has been made to construct a list of all the Anopheles mentioned in abstracts during the year, but since in many of the papers abstracted no mention was made of the capability of mosquitoes to transmit malaria, and since without that information a list is of little value, the idea has been abandoned. Readers are therefore referred to the original abstracts for this kind of information.]

Pathology.

Taliaferro and Mulligan (p. 25) discuss the origin of macrophages which they consider may arise from all cells retaining mesenchymal potencies of development and occur normally in various connective tissues. They do not agree with Mallory regarding endothelial cells. Phagocytosis is non-specific during natural immunity but in acquired immunity it is, in addition, specific. When parasites are introduced into an immune animal there is a regional concentration of parasites and increased phagocytic action. Phagocytic activity, lymphoid hyperplasia and cytogenesis of macrophages are initiated in the spleen where they are most pronounced, but also occur in the liver and bone marrow. Rodhain and Valcke (p. 100) in severe *falciparum* infections found that the polymorphonuclear leucocytes, especially the young forms, were actively phagocytic towards the parasites. This activity is usually displayed by the monocytes.

Sinton (p. 106) points out that in monkey malaria one morphological species may be made up of a number of different races or strains which do not protect to any extent against each other, which vary in vurulence and respond differently to therapeutic agents. Similar races have been met in human malaria. The host may have natural or acquired resistance. Thus *Silenus irus* appears to be naturally tolerant of a *P. knowlesi* infection usually fatal to *S. rhesus*. Acquired resistance is seen in animals resistant to superinfection due to chronic infection with the same strain. In endemic areas highly susceptible children probably die, leaving the more resistant to propagate their kind.

Schilling (p. 429) discusses the possibility of the production of immunity in children by means of minimal treatment to allay symptoms without interfering with the production of immunity. He suggests lines on which observations should be conducted to determine whether such immunity is possible.

Fairley (p. 265) describes the structural and functional changes in the liver which can be attributed to malaria. These cannot be further abstracted. Lintwareff (p. 24) as a result of the experimental

injection of haemoglobin from untreated malaria patients into guinea-pigs, came to the conclusion that in malaria there is a specific toxin which combines with haemoglobins and may cause nephritis.

FONG (p. 576) found that in 1,012 patients treated with therapeutic malaria two died from rupture of the enlarged spleen, though palpable spleens are very rare.

BARBER and RICE (p. 724) describe Barber's index of microscopic anaemia based on the number of abnormal erythrocytes stainable in the manner characteristic of retained nuclear material. In thick films stained by Giemsa these appear as blue clouds of which the number indicates the grade of microscopic anaemia.

Clinical.

There is some difference of opinion as to the value of examination of bone marrow in the diagnosis of malaria. Thus VOORHOEVE (p. 102) established the diagnosis of malaria by sternal puncture in two cases where the blood was negative, but MATSUNOBU (p. 28) found that parasites are not more numerous in sternal puncture smears than in the peripheral blood and that the plasmodia showed no particular tendency to invade the younger forms of erythrocytes. The marrow picture was normal in cases of malaria. RAFFAELE (p. 514) found non-pigmented forms of parasite in the bone marrow obtained by sternal puncture of a man infected 5 days previously with *vivax* sporozoites. Two schizonts were seen, one free and one included in a reticulo-endothelial cell and in one such cell two young trophozoites were found.

KEHAR and HARBHAGWAN (p. 98) found the average sedimentation rate in normal human subjects in India to be 6·4 mm. per cent. There is a considerable increase during acute phases of infection which cannot be correlated with temperature or splenic enlargement.

Henry's reaction.—RAYNAL (p. 264) considers this reaction to be of diagnostic value in malaria. It may be positive in non-malarial cases if the Bordet-Wassermann reaction is strongly positive. It should be performed on donors for blood transfusion. The reaction is a good index of the success of treatment. VOLAVSEK (p. 102) found that Henry's reaction always becomes positive in therapeutic malaria. The reaction is non-specific and is important in liver damage, tuberculosis, carcinoma and syphilis. D'ALESSANDRO (p. 28) found that the reaction usually becomes negative after treatment by the Ascoli method. If negative at the beginning it becomes positive and then finally negative. AKASHI and NAKASHIMA (p. 264) consider that melanin acts merely as an indicator and not as an antigen in Henry's reaction. The reaction is of great use in the diagnosis of malaria. VILLAIN and DUPOUX (p. 27) regard the melanins as the best serological detectors of malaria. They have prepared an artificial melanin combined with iron, which they designate M.A., which behaves almost exactly like Henry's melanin. PIKOUL and OSIPOVA (p. 514) replaced the melanin of Henry's reagent by quinine chlorohydrate and other substances, which gave successful results. The reaction is not therefore an immunity reaction but is probably connected with a disequilibrium between the albumin and globulin fractions of the serum. Too much reliance should not be placed upon it in diagnosis. LIVIERATO *et al.* (p. 515) describe the preparation of an " antigen " substitute for Henry's melanin. BRUMPT and CHORINE (p. 102) record that Henry's reaction in normal uninfected fowls is given in an intensity which in human malaria would be counted as positive. MAYNE (p. 264) reports

a patient whose first paroxysm occurred a year after inoculation with a blood culture of *vivax* sporozoites. BRACHTEL (p. 656) has seen in Bohemia patients in whom malaria appears after long latent periods, usually from 7 months to 1 year.

BROWN *et al.* (p. 728) report the occurrence of the Arthus phenomenon from the bites of *Aëdes aegypti* in a girl of 15. Other mosquitoes caused less severe reactions. Desensitization and passive immunization were only partially successful. The child died of Hanot's cirrhosis.

FISCHER (p. 813) describes a patient with a crop of petechiae which he considers to have been due to benign tertian malaria. They disappeared under quinine treatment. LORANDO *et al.* (p. 728) describe a patient in whom each attack of *vivax* malaria was followed by urticaria with purpuric patches. COMŞA and BRUCKNER (p. 513) saw two patients with *vivax* infection who were admitted to hospital with fever, acute abdominal pain, severe headache and a generalized urticarial rash. Recovery followed quinine treatment.

ACREE (p. 24) details symptoms, due to malaria, which simulate primary disease of the alimentary tract and which are cured by anti-malarial treatment. Gastric catarrh, peptic ulcer, enteritis, ulcerative colitis, dysentery, cholecystitis, appendicitis, acute peritonitis or typhoid may be simulated and ulcers of the tongue, vomiting, cramps, herpes, urticaria, erythema, petechiae, purpura, ulcers and furunculosis may be seen. CANOVA (p. 812) reports 3 cases (in 8,000 treated for malaria) in which *falciparum* infection caused symptoms characteristic of appendicitis. All cleared up under treatment for malaria. [Might these not have been appendicular colic in association with malaria ?] FARINAUD (p. 262) shows that malaria can simulate biliary colic even after the removal of the gall bladder. VAUTHEY and VAUTHEY (p. 813) consider that in 15 of 100 patients at Vichy malaria was the cause of cholelithiasis, and may have been a factor in 16 others. FLEISCHMANN (p. 514) considers that malaria has only a predisposing action in the production of cirrhosis of the liver.

AKASHI and YOSHIMURA (p. 260) in Formosa report albuminuria in 36 per cent. and acute nephritis in 10 per cent. of 490 cases of malaria, and polyneuritis in 7 of 411 cases.

JUNIOR and BRANDÃO (p. 657) quote 10 cases of malaria in which signs and symptoms appeared to indicate suprarenal involvement with asthenia, arterial hypotension, muscular pain and digestive disturbance and, in one case, bronze pigmentation. The prognosis under malarial treatment is much better than in suprarenal insufficiency due to other causes.

MANOHAR and KHOSRAWY (p. 513) describe a patient in whom severe anginal pain, cyanosis, rapid pulse and low blood pressure marked the onset of an attack of malignant tertian malaria. GIORDANO (p. 656) found that of 415 patients repatriated from Italian East Africa on account of malaria 60 suffered from some form of cardiac disturbance, especially acute dilatation.

LEO (p. 262) reports a case of gangrene of the foot in a patient who showed so heavy a *falciparum* infection that all the red cells were parasitized by two to four parasites.

JOURNE and AUBIN (p. 263) describe a patient with psychosis probably due to *falciparum* infection, who was cured by antimalarial treatment. Alcohol may have played some part. LE ROY (p. 186) reports the case of a man admitted to hospital in Tunis as suffering

from cerebrospinal meningitis. The C.S.F., however, was normal and on the 8th day a heavy *falciparum* infection was discovered. Complete recovery followed quinine treatment. Mohr (p. 727) describes 2 cases of epilepsy following malaria and stresses the inflammatory disturbance in the brain due to circulating toxins, which may include haemorrhages, destruction of ganglion cells and proliferation of neuroglia. Scar tissue may result. Symptoms may resemble those of meningitis and the destruction of brain substance may lead to many disturbances, including epileptiform attacks. Willoughby (p. 513) describes a patient with *vivax* infection whose condition simulated severe chorea. The symptoms disappeared abruptly on treatment with quinine. Roger and Boudouresques (p. 187) report a case of malarial polyneuritis with paraplegia in a woman who had suffered from repeated attacks of malignant malaria. Cure followed antimalarial treatment. The onset occurred during a febrile attack and the parasite could always be demonstrated in the blood during any exacerbation of the symptoms. Houssiau (p. 657) describes a case of neuritis of the right radial nerve, with *falciparum* malaria, which cleared up under quinine treatment.

Thomas and Sydenstricker (p. 812) in America found that all the deaths in 244 cases of malaria were due to *falciparum* infection with pernicious symptoms. The mortality of pernicious cerebral malaria was 11·86 per cent. of 76 cases. Price (p. 97) describes pernicious malaria in 24 children. Three had haemoglobinuria, 18 were of the algid type, 7 died.

Fong (p. 576) found that of 34 patients dying while undergoing therapeutic malaria, 11 died from acute malaria and that in 2 others the malaria had activated quiescent pulmonary tuberculosis.

Golden (p. 574) considers that the primary effect of malaria in general paresis is to destroy the spirochaetes.

Boyd and Kitchen (p. 575) used *P. falciparum* for therapeutic malaria owing to the immunity to *vivax* shown by negroes in Florida. The results were satisfactory. Infections during the winter had long incubation periods, short attacks and greatest liability to renewed activity. Infections must be closely watched and quinine given if the temperature exceeds 104°–105° or the parasite count is more than 100,000 per cmm. Thorough intensive quinine treatment after the primary attack makes recurrences unlikely. Bohls and Lawrence (p. 574) in therapeutic malaria found that with the McCoy strain of *P. vivax* the malaria can, under careful supervision, be allowed to terminate spontaneously and that very few relapses occur.

Lotze (p. 733) maintains that in acute infections vitamin C is used up more quickly than normally and that in benign tertian malaria doses of 1,000 mgm. of the vitamin given intravenously prevent rigors and give a feeling of comparative well-being. The vitamin has antitoxic and anti-haemolytic powers; the author discusses therefore the question of vitamin C therapy as an adjunct in blackwater fever. All recent benign infections give rise to a positive Wassermann reaction.

[*To be continued.*] *C. W.*

RABIES.

A Review of Recent Articles. XXX*

i. *Virus.*

Kligler and Bernkopf[1] have failed to convince themselves that the virus of rabies multiplies in the allantois of the chick embryo. In no case did they succeed in obtaining serial passage beyond the third generation. "Whether the virus can be adapted to the chick and its virulence enhanced by passage is a subject for further investigation."

Attempts of the same type have also been made by Veeraraghavan and Philipsz[2] without success. 101 eggs were inoculated but no lesions which were definite enough to be considered as specific were observed. "It was not possible to demonstrate the presence of the virus after the first egg passage."

Under the same conditions Badenski and Bruckner[3] have failed to cultivate the virus of Aujeszky's disease. In one series the virus disappeared at the 7th passage, and in another at the 3rd. They found no evidence of multiplication.

In a second communication[4], from further experiments with Aujeszky's virus they found that a certain degree of multiplication did occur. A maximum was reached in 36 hours, and this was followed by a decline, which they believe to be due to a process of defence on the part of the membrane.

Gerlach[5] has applied the fluorescent microscope to the study of the elementary bodies which are believed by some (Babes, Koch, etc.), to form a part of the life-cycle of the virus of rabies. A number of microphotographs of these are reproduced. He finds these bodies in the meninges, in the central nervous system, in the salivary glands, and in the serous exudates of the body cavities of animals which have succumbed to street or fixed virus rabies. He has found the same bodies in chorio-allantoid cultures, and also in cell-free artificial media cultivated anaerobically. He believes that these bodies are true virus bodies. He states that they are not present in normal animals, nor in other virus infections, nor even in infections with other neurotropic viruses such as poliomyelitis or Aujeszky's disease.

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* For the twenty-ninth of this series see this *Bulletin*. 1938. Vol. 35. p. 641.

[1] Kligler (I. J.) & Bernkopf (H.). Cultivation of Rabies Virus in the Allantois of the Developing Chick Embryo.—*Proc. Soc. Experim. Biol. & Med.* 1938. Oct. Vol. 39. No. 1. pp. 212–214.

[2] Veeraraghavan (N.) & Philipsz (G. L. C.). Cultivation of the Rabies Virus on the Chorio-Allantoic Membrane of the Developing Egg.—*Indian Jl. Med. Res.* 1938. Oct. Vol. 26. No. 2. pp. 493–495. With 1 plate.

[3] Badenski (G.) & Bruckner (I.). Essais de culture du virus de la pseudorage (virus d'Aujeszky) sur la membrane chorio-allantoïde de l'embryon de poulet.—*C. R. Soc. Biol.* 1938. Vol. 129. No. 27. pp. 406–407.

[4] Badenski (G.) & Bruckner (I.). Sur l'évolution du virus de la pseudorage sur la membrane chorio-allantoïde de l'embryon de poulet.—*C. R. Soc. Biol.* 1938. Vol. 129. No. 27. pp. 408–409.

[5] Gerlach (F.). Virusstudien bei Tollwut.—*Ztschr. f. Infektionskr. d. Haustiere.* 1938. Aug. 12. Vol. 53. No. 4. pp. 279–290. With 7 figs. [10 refs.]

Four highly virulent strains of street virus isolated from patients who have died in spite of treatment have been studied by JONNESCO.[6] Each has been subpassaged and fixed in the rabbit, and with subpassage, in each case, Negri bodies, at first numerous, disappeared, as indicated in the adjoining Table in which the figure entered is the incubation period in days, and + or — indicates the presence or absence of Negri bodies.

	Number of passage										
	1	2	3	4	5	6	7	8	9	10	11
Virus Z ...	11	4	3	3							
	+	—	—	—							
,, T ...	10	10	10	6	4	4	3	3	3	3	3
	+	+	+	+	—	—	—	—	—	—	—
,, B ...	12	10	9	6	4	3	3	3			
	+	+	+	+	—	—	—	—			
,, H ...	12	10	9	9	9	9	5	5	4	3	3
	+	+	+	+	+	+	+	—	—	—	—

All four strains were highly pathogenic when administered subcutaneously to mice (mortality 80 per cent.). They were also highly pathogenic on intracerebral inoculation into rabbits, infecting in dilutions of 1/700,000, 1/500,000, 1/600,000 and 1 in 400,000 respectively. Each strain caused symptoms of excitation in the rabbit. There was no evidence of correlation between the incubation period in man and that in the first passage rabbit. These appear to be examples of strains of street virus which already in nature are highly adapted to the central nervous system.

It is well known that the rapid drying of a thin layer of emulsion containing rabies virus gives rise to a powder which conserves its virulence for many months. REMLINGER and BAILLY[7] have studied the effects of exposing the powder so obtained to various temperatures. It appears that the powder remains potent after 2 minutes at 105°C., 3 minutes at 104°, 4 minutes at 103°. One remembers in comparison that ordinary undried emulsions lose virulence after exposure for 60 minutes at 50°, and 30 minutes at 60°C. The authors are of opinion that this loss of virulence in suspensions is not due to desiccation but to autolysis. The fact that dried virus does not lose virulence shows that desiccation does not attenuate but rather conserves virulence. They finally remark that the fact that the virus can support temperatures of 105°C. is not in favour of the view that the virus is protozoal in nature, but rather that it is chemical.

[6] JONNESCO (Démètre). Etude de quatre souches de virus des rues isolées de cas pour lesquels le traitement antirabique a échoué.—*Ann Inst. Pasteur.* 1938. Nov. Vol. 61. No. 5. pp. 527–535. With 1 fig. [14 refs.]

[7] REMLINGER (P.) & BAILLY (J.). La dessiccation est-elle un facteur d'atténuation du virus rabique ?—*C. R. Soc. Biol.* 1938. Vol. 129. No. 25. pp. 133–134.

In a subsequent communication[8] the same authors show that these properties are not peculiar to rabies virus. The virus of Aujeszky in fresh suspension loses virulence when kept at 60°C. for from 45 to 50 minutes, but in the dry powdered state survives for 2 minutes at a temperature of 104·5°C. The virus of equine encephalomyelitis in fluid suspension can stand a temperature of 50°C. for 70 minutes, but not 51°C. for 10 minutes, whilst in powder it withstands 112° for 10 minutes.

The fact that man, in contradistinction to other mammals, only quite exceptionally contracts Aujeszky's disease (this *Bulletin*, 1938, Vol. 35, p. 643) has led NICOLAU, CRUVEILHIER, TRUCHE, KOPCIOWSKA and VIALA[9] to investigate the resistance of the chimpanzee. Successful inoculation of one of these animals had been achieved by three of these authors (this *Bulletin*, 1938, Vol. 35, p. 169). On the third day tremors were observed and temperature oscillated; on the eighth day blood was withdrawn and proved virulent when inoculated into the brain of a rabbit. On the 15th day the chimpanzee presented no abnormal symptoms, and was killed. Inoculation of two rabbits with brain substance did not reproduce the disease. Histological examination of the brain showed nuclear changes in neurones and glia cells. Chromatin was rarefied and clumped; inclusions interpreted by the authors as masses of "degenerated inframicrobes" were observed. The authors believe this to have been a mild case of the disease, characterized by oscillating temperature, tremors, loss of appetite, and ending in cure by auto-sterilization.

In a further communication KOPCIOWSKA and NICOLAU[10] illustrate and describe a toxoplasmic cyst found in the cerebrum of the same animal.

GORET and MARIETTE[11] add the ferret to the long list of animals which can be infected with Aujeszky's virus. Intraocular, intracerebral and intramuscular injections were alike successful in giving rise to the disease in this species.

The reviewer would draw special attention to a very comprehensive summary of Aujeszky's disease by GALLOWAY[12] of the National Institute of Medical Research. The treatment of the subject is excellent in every way, and is based upon a bibliography of 97 communications.

It was stated by BABES in his treatise that two persons who had neither been bitten nor scratched but had "felt the hot breath of a rabid wolf on their faces," subsequently succumbed to rabies.

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[8] REMLINGER (P.) & BAILLY (J.). Action des hautes températures sur les virus rapidement desséchés de la maladie d'Aujeszky et de l'encéphalomyélite des equidés.—*C. R. Soc. Biol.* 1938. Vol. 129. No. 28. pp. 460–462.

[9] NICOLAU (S.), CRUVEILHIER (L.), TRUCHE (C.), KOPCIOWSKA (L.) & VIALA (C.). Neuroinfection autostérilisée à virus de la maladie d'Aujeszky chez le chimpanzé.—*C. R. Soc. Biol.* 1938. Vol. 129. No. 25. pp. 176–178. [11 refs.]

[10] KOPCIOWSKA (L.) & NICOLAU (S.). Toxoplasmose spontanée du chimpanzé.—*C. R. Soc. Biol.* 1938. Vol. 129. No. 25. pp. 179–181. With 1 fig. [12 refs.]

[11] GORET (P.) & MARIETTE (C.). Réceptivité du furet (*Putorius furo* L.) au virus de la maladie d'Aujeszky inoculé par différentes voies.—*C. R. Soc. Biol.* 1938. Vol. 128. No. 22. pp. 871–873.

[12] GALLOWAY (I. A.). Aujeszky's Disease.—*Vet. Rec.* 1938. June 18. Vol. 50. No. 25. pp. 745–762. [98 refs.]

Remlinger and Bailly[13] have conducted experiments to ascertain whether this is a possible mode of infection. Rabbits and guineapigs were exposed to inhalations of powdered brain substance obtained from an animal which had died from the effects of the Rumanian aggressive strain of street virus. Infection was exceptional (8 successes out of 26), and was not effected through the lungs but through the pituitary. A further group of 25 animals remained unaffected after similar treatment with powdered fixed virus.

ii. *Symptoms and Diagnosis.*

Clinical reports of twelve cases of rabies are submitted from Chicago by Blatt, Hoffman and Schneider.[14] Three of the patients had received anti-rabic treatment, one a course of 14 injections, and the other two courses of 21 inoculations. It is presumed from the paper, though not expressly stated, that the method employed was that of Semple. The others had not been treated. The article is copiously illustrated with what is perhaps unnecessary realism.

Dodero[15] gives in somewhat greater detail than in the paper reviewed in this *Bulletin*, 1938, Vol. 35, p. 647, the results of his work on the incubation period of rabies cases at Tonking. It will be remembered that a Table for the treated similar to that quoted in my last review (p. 648) for the untreated was asked for. This, as I remarked before, would be valuable for comparison. It is, however, not yet forthcoming.

iii. *Pathology.*

It is reported from the South African Institute for Medical Research[16] that in the case of a child suffering from rabies the cerebrospinal fluid was drawn off a few hours before death, and inoculated intracerebrally into two rabbits. Neither of these developed rabies. The brain of the child was examined both microscopically and biologically. Negri bodies were found, and of two rabbits inoculated intracerebrally with brain material both contracted infection. Thus in a definite case of rabies the virus was absent from the cerebrospinal fluid.

iv. *Methods of Treatment and Statistics.*

Jacotot, Colson and Le Roux[17] have conducted a series of experiments on the efficiencies of vaccines subjected to the influence of phenol, formalin, and ether-phenol. They state that in 3 out of 4 of these experiments, formolized vaccine proved superior to carbolized, whilst ether vaccine subsequently phenolized was not superior to

[13] Remlinger (P.) & Bailly (J.). Sur un mode exceptionnel de contamination rabique.—*Bull. Acad. Méd.* 1938. June 21. 102nd Year. 3rd Ser. Vol. 119. No. 24. pp. 720–724.

[14] Blatt (Maurice L.), Hoffman (Samuel J.) & Schneider (Maurice). Rabies. Report of Twelve Cases, with a Discussion of Prophylaxis.—*Jl. Amer. Med. Assoc.* 1938. Aug. 20. Vol. 111. No. 8. pp. 688–691. With 6 figs.

[15] Dodero (J.). Sur la durée d'incubation de la rage au Tonkin.—*Ann. Inst. Pasteur.* 1938. Aug. Vol. 61. No. 2. pp. 193–204.

[16] South African Institute for Medical Research. Annual Report for Year ended 31st December, 1937 [Lister (Spencer), Director]. [Rabies pp. 13–15.]

[17] Jacotot (H.), Colson (M.) & Le Roux (G.). Contribution à l'étude expérimentale de la vaccination antirabique.—*Ann. Inst. Pasteur.* 1938. July. Vol. 61. No. 1. pp. 92–103.

simple phenol vaccine. The figures of the combined experiments are as follows :—

	Animals used	Deaths	Mortality per cent.
Phenol	36	19	52·8
Formalin	36	9	25
Ether phenol	18	6	33·3

[Examination of these figures shows that phenol is significantly (though not highly so) different from formalin (P=0·02), and that ether-phenol is not significantly different from either phenol or formalin (P=0·13 and 0·53 respectively). As the result is somewhat inconclusive, confirmation is necessary before it can be accepted.] They also obtained greater success when a vaccine was given in 2 doses, than when the same quantity was given in a single dose.

A comparative experiment on the rate of appearance of and the titre of antirabic substances in the serum after immunization by dried cords and by Fermi's phenol vaccine has been carried out by Cruveilhier, Lépine and Viala.[18] A number of rabbits received various numbers of injections (15, 18, 21 and 25) of the two types of vaccine, and their sera were examined at various intervals of time after the last injection. The table is too long to be repeated here, but the results obtained lead the authors to conclude that under the conditions of their experiments, vaccination according to the method of Fermi confers the same anti-rabic power to the serum as does vaccination by dried cords.

It is reported by Cruveilhier and Viala[19] that of 454 persons treated at the Pasteur Institute in Paris during the year 1937, none died of the disease. One case of post-vaccinal paralysis occurred. Symptoms of paralysis of the lower limbs and of the sphincters appeared after the fifteenth injection, but these lasted only for a little over a fortnight. The Paris fixed virus strain was on 1st January, 1938, in its 1,590th passage. The method employed, as in former years, is Calmette's modification of the original dried cord treatment.

At the Pasteur Institute at Tunis[20] 1,190 persons at risk from rabies infection were treated during the year 1937. Of these, two contracted the disease. The method of treatment was that of dried cords. No paralytic sequelae occurred.

An outbreak of rabies during the year 1937 was reported from Singapore[21]. Arrangements were made for the prophylactic inoculation

[18] Cruveilhier (L.), Lépine (P.) & Viala (C.). Pouvoir rabicide du sérum sanguin de lapins vaccinés contre la rage comparativement par la méthode des moelles desséchées et au moyen du vaccin phéniqué.—*Ann. Inst. Pasteur.* 1938. Aug. Vol. 61. No. 2. pp. 187–192.

[19] Cruveilhier (L.) & Viala (Ch.). Les vaccinations antirabiques à l'Institut Pasteur en 1937.—*Ann. Inst. Pasteur.* 1938. June. Vol. 60. No. 6. pp. 661–666.

[20] Archives de l'Institut Pasteur de Tunis. 1938. June. Vol. 27. No. 2. pp. 219–238.—Fonctionnement des services de l'Institut Pasteur pendant l'année 1937.

[21] Federated Malay States. Annual Report of the Institute for Medical Research for the Year 1937 [Kingsbury (A. Neave), Director].—[Rabies pp. 120–129. Lewthwaite (R.).]

of the whole dog population of Singapore island, the number of which was estimated at about 13,000. Between August and November 41 dogs brains were sent to the laboratory for examination, and 12 proved to be positive. The last positive result was obtained in November. The number of human patients treated in 1937 was 169, as compared with 21 in the previous year. No deaths occurred, but one case of post-vaccinal paralysis with symptoms of peripheral neuritis of the beriberi type is recorded. The vaccine administered was a 2 per cent. emulsion of fixed virus sheep's brain in 0·5 per cent. carbol saline.

The sterility of cords utilized for the preparation of dried cord vaccines, and of brains utilized for the preparation of phenol vaccines (Semple) has been studied by Dodero[22] at the Pasteur Institute of Hanoi. Of the former the percentage of contaminations during the hot weather was 18·3, and during the cold season 13·8. Of the latter the percentages of contaminations were 3·8 and 3·7 during hot and cold seasons respectively. Brain and cords were taken from the same animals. It appears that the brain is more resistant to contaminating infection than is the cord.

Edwards[23] puts forward evidence in favour of the view that treatment is unnecessary in the case of a person bitten by a dog which remains alive and *well* for 10 days after it inflicted the bite.

v. *Rabies in Animals.*

The problem of the spread and control of rabies in the South American cattle ranches is one of greater economic importance than may be realized. In a much condensed but very illuminating paper Molina[24] discusses the situation as it exists in the Matto Grosso. The following summarized Table shows the extent of the damage caused by the disease in the area served by the Pasteur Institute at Caceres (Matto Grosso).

Years.	Cases of bovine rabies amongst		Total
	Unvaccinated	Vaccinated	
1934	5,700	195	5,895
1935	5,280	180	5,460
1936	2,430	345	2,775
1937	1,100	157	1,257
	14,510	877	15,387

The total number of cattle in the area in question is estimated at 115,000, so that the total incidence was about 1·09 per cent. in 1937. In certain ranches the incidence is greater, for example in " Cachoeira "

[22] Dodero (J.). Taux de souillure des moelles et des cerveaux rabiques.—*Bull. Soc. Path. Exot.* 1938. July 6. Vol. 31. No. 7. pp. 562–564.

[23] Edwards (W. P. S.). Note on Anti-Rabic Inoculation of Dogs in India.—*Jl. Roy. Army Vet. Corps.* 1938. Aug. Vol. 9. No. 4. p. 187.

[24] Molina (Anibal). Profilaxia da raiva pela vacinação.—*Bol. Soc. Brasileira de Med. Vet.* Rio de Janeiro. 1938. Mar. & Apr. Vol. 8. No. 2. pp. 103–106.

amongst 2,500 vaccinated cattle, 70 died, or 2·8 per cent. It will be remembered that in these localities the disease is spread by the vampire bat, and that naturally the distribution of the disease corresponds with the distribution of that vector. An intensive campaign of vaccination has been carried out in connexion with the Pasteur Institute at Caceres during recent years, and the results of that activity, coupled no doubt with measures against the bat, are indicated in the above Table, which shows that the incidence of cases in 1937 is approximately one-fifth of what it was in 1934. It is not possible to achieve complete vaccination of a whole herd. This is particularly difficult in breeding establishments, where it is estimated that about 20 per cent. escape vaccination, on account of wandering over the prairies. The vaccine employed consists of 1 part of brain substance in 9 parts of phenol glycerine. The dosage is from 20–40 cc. and this is easily tolerated. Animals which have received three such doses, one each year, appear to have acquired a solid immunity. In highly infected ranches the effects of herd inoculation do not persist for more than six months. In lightly infected ranches, on the other hand, single inoculations lead to the disappearance of the epidemic. The dominant factor controlling the size of an epidemic is not so much the density of the bovine population, as the prevalence of the vampire bat. During the summer months the vaccine should not be kept for more than 40 days after preparation. The general results are as follows. In ranches situated within an infected area, but themselves still uninfected, vaccination of the herd has been "absolutely efficient." When used in infected ranches within the infected area the effect is still great, but eradication of the disease cannot be achieved. As a solid immunity can only be attained after three successive inoculations—a procedure which may be impossible in prairie country—complete eradication of the epizootic by prophylactic vaccination alone cannot be expected.

In a long critical review of rabies treatment in general, and of the methods of control of the canine epizootic, PENNA[25] discusses the various points which relate particularly to Rio de Janeiro. He recommends that in the case of animal inoculation, dead vaccines should be used (phenol vaccine : Semple), but that in the case of human beings a living vaccine (dried cords) should be employed. He draws attention to the dangers which may arise from the use of living vaccines on animals. Cases of *rage de laboratoire* may occur, with serious results.

Further statistics regarding the prophylactic vaccination of dogs at Tunis relating to the year 1937 are reported by BALOZET[26]. Amongst 1,829 primary and 782 revaccinations of dogs no failure has been recorded. With regard to curative treatment, of 44 horses one died, and of 32 cattle three died of rabies.

vi. *Post-Vaccinal Paralysis.*

BEACH[27] reports a case of painful paralysis of the extremities after antirabic treatment, and asks the editor of the *Journal of the American*

[25] PENNA (Oswino). O problema da raiva no Rio de Janeiro.—*Bol. da Secretaria Geral de Saude e Assistencia.* Rio de Janeiro. 1937. Dec. 31. Vol. 3. No. 6. pp. 13–31. French summary.

[26] BALOZET (Lucien). La vaccination antirabique des animaux en Tunisie du 1er Janvier au 31 décembre 1937.—*Arch. Inst. Pasteur de Tunis.* 1938. June. Vol. 27. No. 2. pp. 241–244.

[27] BEACH (W. R.). Painful Paralysis after Antirabic Treatments. [Queries & Minor Notes.]—*Jl. Amer. Med. Assoc.* 1938. May 28. Vol. 110. No. 22. p. 1857.

Medical Association for advice as to treatment. The reply, amongst other suggestions, contains the following. "If there is any improvement taking place, regardless of how little, the suggestion is made that watchful waiting and symptomatic supervision be the keynote of any treatment. If the pain is disturbing, one can consider either a chordotomy or section of a sufficient number of posterior roots to the affected extremity." Surely the latter is a very drastic remedy.

vii. *Miscellaneous.*

An excellent and comprehensive article on rabies in general is contributed by MILLISCHER.[28] It is, however, difficult to accept his view that the rat is "an active propagator of rabies in countries which have been little developed." The author accepts the view that phenol vaccines constitute the method of treatment of the future.

A. G. McKendrick.

i. REMLINGER (P.) [Directeur de l'Institut Pasteur de Tanger] & BAILLY (J.) [Chef de Service à l'Institut Pasteur de Tanger]. Etudes sur la rage. [**Studies on Rabies.**] Monographies de l'Institut Pasteur.—174 pp. With 1 fig. 1938. Paris: Masson et Cie, 120 Boulevard Saint Germain. [40 *fr.*]

ii. —— & ——. La maladie d'Aujeszky. [**Aujeszky's Disease.**]—204 pp. With 17 figs. 1938. Paris: Masson et Cie, 120 Boulevard Saint-Germain. [45 *fr.*]

The names of REMLINGER and BAILLY are well known to all readers of rabies literature. [Perhaps I may be pardoned if I remind readers that the name of the former is pronounced in the French fashion with a soft G.] They became associated in the year 1925, and since then have been the most active of all workers in the field of rabies. REMLINGER himself had devoted all his energies in this direction since the beginning of the century. The success of that devotion may be judged by the fact that during the years 1903–1911 there emanated from his laboratory at Constantinople no less than 65 papers on rabies, and that during the years 1917 to 1937, from the Pasteur Institute at Tangiers, he—at first alone, and latterly in collaboration with BAILLY—was responsible for the publication of 201 papers on rabies, and 30 on Aujeszky's disease. The merits of these communications are recognized by all acquainted with the study of rabies and pseudo-rabies. From the reviewer's card index it appears that since 1924 when the first of this series of reviews was written, 146 papers which bear the names of one or other or both of these authors have been extracted. Consequently the field covered by the two books under review has already been placed before readers of this *Bulletin.*

i. The first monograph, on rabies, is a record of original work. This covers such subjects as the diffusibility of the virus, and its presence in the various tissues and organs; the uniqueness of street virus and the plurality of fixed virus; the occurrence of rabies in various animals; the effect of subpassage on the virus in relation to pasteurian treatment; paralytic accidents and *rage de laboratoire*; immunization by ether and phenol vaccines, etc.

[28] MILLISCHER (P.). Etude étiologique, clinique et prophylactique de la rage. Conduite à tenir en cas de morsures suspectes.—*Rev. Service Santé Milit.* 1938, June. Vol. 108. No. 6. pp. 857–872.

ii. The second, on Aujeszky's disease, contains a vast amount of original matter, but in addition it is in the nature of a general treatise. It opens with a short biography of Aladar AUJESZKY, who recognized the disease as a clinical entity in Budapest in 1902. This is followed by a chapter of history, tracing how the disease came to be recognized in the New World as well as in the Old. Thereafter follows a systematic exposition of the scientific and clinical aspects of the disease as it occurs in nature and in the laboratory, and a discussion of the nature of the virus. This book is recommended to all workers interested in virus diseases. *A. G. McKendrick.*

TRYPANOSOMIASIS.

Précis of Abstracts in this Section.

Lester (p. 204) shows that in Northern Nigeria sleeping sickness is most prevalent in the central part of the country. It is usually of mild type, but produces lowered resistance to other diseases. A rapidly fatal toxaemic form, without any sign of involvement of the nervous system, and the classical form also occur. Recently there has been a spread into areas previously little affected. Treatment is by germanin or antrypol and tryparsamide.

Hoare (p. 205) gives a detailed account of the size, shape and position of the kinetoplast in mammalian trypanosomes. This cannot be further abstracted. He concludes that Jacono's classification cannot be applied to mammalian trypanosomes and that the generic name *Castellanella* is inadmissible.

Corson (p. 208) reports that further cyclical transmission of a strain of *T. gambiense*, which has now been studied in this way for four years, by *G. morsitans* in monkeys, has not resulted in change of virulence or morphology. Direct transmission through monkeys, guineapigs and white rats, however, has led to certain variations. As a result of maintaining a strain of *T. rhodesiense* in sheep by cyclical passage through *G. morsitans* for almost four years, he (p. 208) concludes that *T. rhodesiense* is a parasite, not only of man, but also of wild and domestic animals in sleeping sickness areas, and may retain its infectivity for man for several years at least. He recognizes differences between individuals in resistance to infection, and describes the local swellings caused in man by trypanosomes at the site of infection. Working with a strain of *T. rhodesiense* the same author (p. 210) found that no change in virulence occurred as a result of prolonged passage through ruminants. Flies fed on a reedbuck infected with this strain frequently showed infected salivary glands; no such glands were found in flies fed on a similarly infected gazelle. He also (p. 210) found that the cerebrospinal fluid of 22 of 27 monkeys infected with *T. rhodesiense* was infected. In one the duration of the disease was only 19 days, in the remainder it was from 1½ to 7 months. In man, early diagnosis and treatment are of importance, in view of the possibility of early cerebrospinal involvement.

van Hoof *et al.* (p. 211) found that drug resistance of *T. gambiense* to Bayer 205 is unstable, decreasing on mechanical passage and on cyclical passage through *G. palpalis*. Launoy and Lagodsky (p. 212) found that a tryparsamide-resistant strain of *T. annamense* was less sensitive to antimony than the normal strain. Launoy (p. 212) found that the natural chemo-resistance of *T. congolense* is not identical with the artificial chemo-resistance of *T. annamense*, since the reaction of these in mice was not the same under treatment with certain drugs.

Halberstaedter (p. 213) measured the dose of X-rays necessary to cause loss of motility and infectivity in *T. gambiense*. Jahnel (p. 213) found that *T. equiperdum* and *S. recurrentis* remained alive after cooling to —269·5°C.

Carpano (p. 214) recognizes that trypanosomes can be arranged in series from those essentially blood parasites (*T. evansi* and *T. vivax*) to the almost exclusively tissue parasites (the leishmanias).

Ghidini (p. 214) notes the distribution of *Glossina* in Italian East Africa.

Taliaferro (p. 214) found that in *T. duttoni*, as in *T. lewisi* infections, a specific reproduction-inhibiting antibody, ablastin, and a specific trypanocidal antibody, both passively transferable, are found in mouse serum. A group reaction between *T. duttoni* and *T. lewisi* and their ablastins occurs *in vivo*.

French (pp. 215–216) discusses the changes in blood sodium, potassium, calcium, chlorine and inorganic phosphorus in *T. congolense* and *T. brucei* infections.

Fournials (p. 216) points out that signs of trypanosomiasis may only appear after the return of infected persons to Europe.

Guibert and Boscq (p. 216) emphasize the importance of bone marrow examination in diagnosis. It may be positive when blood and gland juice are negative. Jospin and Gallais (p. 217) also describe a patient whose bone marrow was positive when other examinations were negative. Thiroux (p. 217) emphasizes that the inoculation of monkeys with blood is a very delicate test.

Brown and Broom (p. 217) studying the red cell adhesion test found that standard concentrations of red cells and trypanosomes are necessary to produce constant results and complement must be present. Certain human red cells will not adhere to sensitized trypanosomes. Brown (p. 218) found that in mice the electrical charge of polymorphic trypanosomes undergoes a reversal of sign if relapse occurs after spontaneous cure. The nature of the host apparently has a definite effect upon the sign of the change of trypanosomes. A simple test is described for determining the sign, positively charged trypanosomes becoming adherent to the red cells.

Parkin (p. 219) records instances of spontaneous recovery in animals infected with *T. vivax* and *T. congolense*.

Masseguin (p. 220) has written a general account of treatment.

Hawking (p. 220) analyses the trypanocidal action of trivalent arsenicals and acriflavine. The reaction probably occurs in three stages, fixation of the drug, secondary chemical reaction and death of the trypanosome. King, Lourie and Yorke (p. 221) obtained permanent cure in approximately 100 per cent. of mice and rabbits infected with a laboratory strain of *T. rhodesiense* by the use of n. undecane-1 : 11-diamidine. This drug has also a definite action on human simple tertian malaria. Several aromatic amidine and guanidine compounds showed trypanocidal action *in vitro* and some produced cures in mice. Lourie and Yorke (p. 221) describe drug resistance in trypanosomes. Each of the four types of resistance is specific for its own group of chemical compounds. The four types are : (a) resistance to the aromatic compounds of arsenic and antimony and to acriflavine. (b) Superadded tartar emetic resistance. (c) Resistance to Bayer 205. (d) Resistance to the amidine and guanidine compounds.

van Rensburg (p. 222) found that surfen C caused serious local reactions in bovines on intramuscular injection and was ineffective against *T. congolense* infection. Biozzi (p. 223) found that various oligodynamic solutions and colloidal preparations of metals possessed therapeutic properties.

Brown (p. 223) shows that in parts of Uganda an almost perfect equilibrium between *T. gambiense*, man and *G. palpalis* has been reached. He discusses bush clearing and other means of control. Antrypol in 1 gm. doses can protect clearing gangs for three months. Nash (p. 224) considers that in Northern Nigeria (unlike East Africa) it would be inadvisable to practise densification of woodland by fire

exclusion in *G. morsitans* belts. It could only be successful in the south where a cooler, moister climate makes tsetse prefer open conditions.

Talice and various others (p. 225 *et seq.*) describe early cases of Chagas' disease in Uruguay. Oedema of the face, dacryoadenitis, cervical and other adenitis, thyroid enlargement, anaemia, leucocytosis with relative mononucleosis and slight splenic enlargement were among the features noted. "Sulfanil" was beneficial in one case. Mazza *et al.* (p. 227) describes the pathological appearances found post-mortem in a case of chronic Chagas' disease. Lobo *et al.* (p. 228) found the incidence of thyroid enlargement in certain parts of the Argentine to vary from 23·34 to 45 per cent. of those examined. This is interesting in view of the importance attributed to this condition in Chagas' disease.

Cardoso (p. 228) showed that metacyclic forms of *T. cruzi* in faeces of *T. infestans* can pass through intact mucous membranes and scarified skin. Infection by bite occurred in one instance, possibly owing to regurgitation from the insect's intestine or contamination of the mouth parts. Dias and Torrealba (p. 229) found crithidial and metacyclic forms of *T. cruzi* in the duodenum and rectum of *Eutriatoma maculata*, a natural vector of infection of Chagas' disease. Gasic (p. 229) gives the percentages of infected *Triatoma* in Santiago province. Forty-five per cent. were infected in one area.

Talice (p. 230) obtained a positive result with the xenodiagnostic test in a patient regarded as suffering from a reinfection. Dias (p. 230) reports that two patients who were in the chronic stage of Chagas' disease in 1922 both gave positive xenodiagnostic tests with *Panstrongylus* (*Triatoma*) *megistus*. Mazza (p. 231) gives instructions for laboratory diagnosis, including the xenodiagnostic procedure.

Talice (p. 231) found cats to be naturally infected in Uruguay. Culbertson and Kolodny (p. 231) found complete immunity in rats which have recovered from *T. cruzi* infection. *C. W.*

Lester (H. M. O.). **The Progress of Sleeping Sickness Work in Northern Nigeria.**—*West African Med. Jl.* 1938. Oct. Vol. 10. No. 1. pp. 2–10. With 1 map.

In a previous paper [this *Bulletin*, 1933, Vol. 30, p. 430] the author described the history of sleeping sickness in Northern Nigeria up to the end of 1931, and the train of events which led to the adoption of the French system of mass survey and treatment. At that time it was thought that the areas of epidemic sleeping sickness were quite circumscribed, but the first year's work of the survey system in 1931 showed that the position was much more serious than had been thought previously.

By the beginning of 1938 some 2,200,200 people had been examined and about 300,000 cases found and treated. Investigations into the incidence of the disease have now been made in every province in Northern Nigeria. The main epidemic belt is confined to the central part of the country, *viz.* Zaria Province, Niger Province, the Southern parts of Katsina and Kano Provinces, and parts of Benue and Plateau Provinces.

Taken as a whole the disease is of a mild type. Lester states that three types of the disease are met with :—

(*a*) The commonest is a mild form which often constitutes more than 95 per cent. of the cases met with. After initial fever and headache the

patient reaches a stage where the disease and his resistance to it appear to have obtained a state of equilibrium. He suffers from periodic attacks of headache and fever and a certain amount of weakness. The cervical glands are enlarged ; there are transient signs of toxaemia, such as puffiness of the face, swelling of the limbs, and occasional albuminuria. The patients are below par mentally and physically, and may remain in this state for years. They have a lowered resistance to other diseases, so that the death rate among them is higher than it should be. It is this lowered resistance which is at the root of the very real depopulation which has occurred in some of the more heavily infected areas.

(*b*) In the second type, which is much rarer, toxaemia is the salient feature. Patients complain of headache, fever and weakness ; oedema is common and a certain proportion become completely waterlogged. The progress of the disease is rapid, the patients dying without any sign of involvement of the central nervous system.

(*c*) In this type the disease behaves as it should do according to the text book description. Sooner or later the nervous system becomes involved extensively and the patient reaches the characteristic " sleeping " stage.

The proportion of cases in the three classes varies in different epidemics, but almost always the first type preponderates. In the more virulent epidemics the second and third types are relatively more numerous than in the milder ones.

Lester states that all the evidence available suggests that there has been a disconcerting spread of the disease into areas previously little affected. The disease has become epidemic recently in many places where it was previously endemic. There are three chief causes for this, *viz.* : (1) the change in the habits of the people, consequent on pacification and settled rule ; (2) the increase in transport facilities ; (3) the employment of gangs of labour for railway constructions, mining, and roadmaking.

Therapeutic measures.—At first the disease was treated with tryparsamide. The results were on the whole good, but ocular disturbance and arsenical dermatitis, although comparatively rare, gave a good deal of trouble.

References have already been made [this *Bulletin*, 1934, Vol. 31, p. 570] to a very serious accident which occurred at one centre in 1932, many of the patients becoming violently ill after the first 2 gram dose, some of them dying of acute arsenical poisoning in from three to seven days, and others becoming blind. It was later observed that toxic symptoms only occurred when boiled and filtered water was used instead of distilled water. The issue of portable stills to all sleeping sickness teams overcame this difficulty.

Towards the end of 1934, the present system of treatment with three 1 gram doses of germanin or antrypol, followed by five 2 gram doses of tryparsamide, was introduced.

The rest of the report, which must be studied in the original by those interested, consists of an account of the work of the sleeping sickness teams and a description of the present organization. *W. Yorke.*

HOARE (Cecil A.). **Morphological and Taxonomic Studies on Mammalian Trypanosomes. V. The Diagnostic Value of the Kinetoplast.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1938. Nov. 26. Vol. 32. No. 3. pp. 333–342. With 12 figs. [11 refs.]

This paper is an attempt to bring together and to correlate the data concerning the features presented by the kinetoplast in various species

Differential Characters of the Kinetoplast in Mammalian Trypanosomes.

Group	Species	Characters of Kinetoplast								
		Size		Shape			Position			
				Rounded						
		Diameter (μ)	Area (μ²)	Circular (%)	Oval or Elliptic (%)	Rod (%)	Sub-central (%)	Sub-terminal (%)	Terminal (%)	Marginal (%)
Lewisi ...	*T. lewisi*	1·0	0·8	15	85	—	—	100	—	—
	T. theileri	1·1	0·9	76	24	—	—	100	—	84
	T. cruzi	1·2	1·1	70–81	19–30	—	—	100	—	—
	T. evotomys	1·0	0·8	84	16	—	—	100	—	8
	*T. melophagium** ...	1·4	1·5	—	+	+	+	—	—	+
Vivax ...	*T. vivax*	1·1	0·9	30–52	48–70	—	—	24–69	31–76	16–28
	T. uniforme	1·1	0·9	38–54	46–62	—	—	26–35	65–74	25–31
Congolense ...	*T. congolense* ...	0·7	0·4	20–45	10–40	15–70	—	86–93	7–14	78–89
	T. simiae	0·8	0·5	52	26	22	—	99	1	89
Brucei ...	*T. brucei*	0·6	0·3	25	—	75	—	74	4	22
	T. rhodesiense ...	0·6	0·3	11	—	89	—	74	3	23
	T. gambiense	0·6	0·3	5	—	95	—	62	8	30
Evansi ...	*T. evansi*	0·7	0·4	17–40	7–12	48–76	—	91–99	1–9	27–47
	T. equiperdum ...	0·6	0·3	25	—	75	—	100	—	39

*Only two specimens of this species were available.

of mammalian trypanosomes. The term " kinetoplast " is employed in its original sense to denote the kinetonucleus alone, without the blepharoplast. The material forming the basis of the study consisted of blood films, stained by one of the Romanowsky methods, of 14 species of mammalian trypanosomes. The characters of the kinetoplast examined were its shape, size, and position in the body. The author summarizes his observations in the above Table.

The differential diagnosis of the various trypanosome groups and species on the basis of the characters of the kinetoplast (as shown in this Table) can be stated as follows :—

I. *Lewisi* Group

" Kinetoplast large (1·0 to 1·4μ) : shape rounded ; position subterminal or subcentral, *never* terminal.

" (1) *T. lewisi* : kinetoplast typically *elliptic* in outline ; position subterminal, *far* from posterior end of the body.

" (2) *T. theileri* : kinetoplast typically *circular* in outline ; position subterminal, *far* from posterior end of the body in all and marginal in majority.

" (3) *T. cruzi* : kinetoplast *very* large, typically irregularly *circular* in outline ; position subterminal, *near* the posterior end of the body. Owing to its size and position, it is in contact with both sides of the body.

" (4) *T. evotomys* (from vole) : kinetoplast typically circular in outline ; position subterminal, in a few marginal.

" (5) *T. melophagium* (ovine) : (available material too scanty for comparison : included in the table as an illustration of trypanosome with large kinetoplast in *subcentral* position).

II. *Vivax* Group

" (6) *T. vivax* and (7) *T. uniforme* : distinguished from the remaining three groups of *pathogenic* trypanosomes by the *large* size of the kinetoplast (1·1μ) ; its shape is *always* rounded, more or less regularly circular or elliptic in outline ; position terminal or subterminal, in a fair number also marginal.

III. *Congolense* Group

" (8) *T. congolense* and (9) *T. simiae* : kinetoplast of *medium* size (0·7 to 0·8μ) (considerably smaller than in the *Vivax* group, but slightly larger than in the *Brucei* group) ; shape may be rounded or rod-like ; position in great majority subterminal and *marginal*. When the arrangement is marginal, the rhizoplast of the flagellum frequently starts from the *posterior* part of the kinetoplast and the latter, if elongated, usually lies more or less parallel to the long axis of the body (*cf. Brucei* group).

IV. *Brucei* Group.

" (10) *T. brucei*, (11) *T. rhodesiense* and (12) *T. gambiense* : kinetoplast *small* (0·6μ), usually rod-shaped ; position in the majority subterminal, and in a fair number marginal. In the latter case the kinetoplast, if elongated, usually lies transversely to the long axis of the body, while the rhizoplast in most cases starts from the anterior part of the kinetoplast. The last two features may help to distinguish the ' stumpy ' trypanosomes of this group from *T. congolense* (*v. supra*).

V. *Evansi* Group.

" (13) *T. evansi* and (14) *T. equiperdum* : as regards the kinetoplastic characters, the above members of this group do not differ in any respect from those of the *Brucei* group, but *T. equinum* (not shown in the table) differs from all other trypanosomes in the absence of the kinetoplast."

Hoare concludes from the facts adduced in this paper that JACONO's classification cannot be applied to the mammalian trypanosomes, the two main divisions of which—the *Lewisi* group on the one hand and the other four groups on the other—cannot be differentiated by the position of the kinetoplast. This being so, the presence among these trypanosomes of species in which the kinetoplast occupies the same situation as in *T. rotatorium*, likewise precludes the adoption of the genus *Castellanella* for the mammalian trypanosomes [see also this *Bulletin*, 1938, Vol. 35, p. 327]. *W. Y.*

CORSON (J. F.). **A Third Note on a Strain of *Trypanosoma gambiense* transmitted by *Glossina morsitans*.—*Ann. Trop. Med. & Parasit.* 1938. Oct. 12. Vol. 32. No. 3. pp. 245–248.

A strain of *T. gambiense* was isolated from man in Uganda in March 1934; it was received at Tinde in a monkey on August 3rd, and transmissions with *Glossina morsitans* were begun in September 1934. Observations on this strain from that time until February 1937 have already been published [this *Bulletin*, 1937, Vol. 34, p. 921] and the present note gives later information.

The object of the experiment was to ascertain whether a strain of *T. gambiense*, as a result of continued cyclical passages through *G. morsitans*, or in the course of mechanical transmissions, would come to resemble *T. rhodesiense*. Since February 1937, three more passages by *G. morsitans* have been made, but up to June 1938, the cyclically transmitted strain appears to have undergone no change as regards virulence and morphology. Details of this part of the experiment (the cyclical transmission by *G. morsitans* in monkeys) from its commencement are given in a table.

Direct transmissions through monkeys, guineapigs and white rats, more or less in rotation, have been continued with varying results. In monkeys and in some guineapigs and rats the strain retained its low pathogenicity, but in a rat and a guineapig inoculated from a rat in April 1937, the strain showed much greater virulence, and this has since continued in these animals, but not in the monkey. The strain has also become less polymorphic and rarely shows any nuclear displacement. There was no real resemblance to any Tanganyika strains of human trypanosomes which Corson has seen. Four attempts to infect *G. morsitans* from monkeys and guineapigs with this direct transmission strain have failed. Details of this part of the experiment from its commencement are also given in a Table. *W. Y.*

CORSON (J. F.). **A Fourth Note on the Infectivity to Man of a Strain of *Trypanosoma rhodesiense*.—*Jl. Trop. Med. & Hyg.* 1938. Aug. 15. Vol. 41. No. 16. pp. 262–265.

The author has continued his work on the infectivity of a strain of *T. rhodesiense* which he has maintained in ruminant animals (sheep and antelopes) since October 1934 by cyclical passage through *G. morsitans* [this *Bulletin*, 1937, Vol. 34, p. 931]. The infectivity of the strain, which was maintained solely in sheep, was tested by feeding two isolated infective flies on two volunteers; both became infected.

In the antelope strain a fly which had failed to infect a volunteer, who had been shown to be susceptible to the strain in sheep about 21 months before, infected a dikdik, and the infectivity to man of flies

infected by this dikdik was tested on 10 volunteers, 8 of whom became infected. Two other flies, which had become infected by feeding on eland number 5, had failed to infect volunteers. These flies infected sheep, and the infectivity of flies infected on them was tested on 15 volunteers, 7 of whom became infected. Details are given in three Tables. Corson draws attention to the apparent difference in the infectivity to man between two flies which had fed at the same time on one of the sheep ; one of the flies failed to infect a volunteer, but the other fly infected him 11 days later.

An interesting point which arises out of this work on volunteers is the frequency and prominence of local swelling caused by the trypanosomes at the place of infection. Only one of the 30 infected volunteers in this series of experiments has failed to develop a local reaction. Corson writes :—

" In my experience this swelling on the arm, with its associated axillary pain, was almost always a very definite thing and a sure sign of infection. Trypanosomes were found in blood films, made by pricking the skin of the swelling and gently squeezing, in greater number and earlier, sometimes two or three days earlier, than in the blood taken from the lobe of the ear. The interval of time between the bite and the appearance of the swelling was commonly five, six, or seven days."

Commenting on the results of his experiments, Corson writes that clearly the infectivity to man of the strain maintained in sheep and antelopes since October 1934 has not been lost. It cannot, however, be inferred that all strains of *T. rhodesiense* would retain their infectivity to man for so long in the same circumstances. Moreover, if this strain should prove to lose its infectivity to man in say five or more years, it could not be inferred that this would happen in nature, where many combinations of ruminants and other hosts of various degrees of resistance could serve as hosts of the trypanosomes.

Corson thinks it may be concluded that *T. rhodesiense* is a parasite not only of man but also of wild and domestic animals in sleeping sickness areas, and that it may retain its infectivity to man for at least several years, and perhaps indefinitely, while living only in animals and tsetse flies.

People differ in their resistance to infection ; a man may be bitten by an infective fly without becoming infected, whilst the same fly would infect another person. Again, the observation noted above shows that a man may resist infection from the bite of one fly and become infected from the bite of another, which had derived its infection by feeding on the same animal and at the same time as the former fly.

It is probable that all strains of *T. rhodesiense* in nature are of heterogeneous composition, and this may partly account for the difference between strains owing to selection by tsetse flies.

In nature it seems likely that many tsetses become infective with *T. rhodesiense* by feeding on infected antelopes ; but in nature antelopes and other animals differ from man in being infected with other trypanosomes, and it is not known whether this has any influence on the infectivity of *T. rhodesiense* to *G. morsitans* and on the susceptibility of the animals to *T. rhodesiense*.

In conclusion, Corson states that he thinks it desirable that the question should be primarily investigated by shooting a large number of animals in a suitable sleeping sickness area, inoculating white rats and inoculating volunteers from the infected rats. *W. Y.*

Corson (J. F.). **Observations on the Pathogenicity for White Rats of a Strain of** *Trypanosoma rhodesiense.*—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1938. Nov. 26. Vol. 32. No. 3. pp. 343–345.

A strain of *T. rhodesiense* was obtained in October 1934 by feeding laboratory-bred *Glossina morsitans* on an untreated patient infected in Kahama. The strain was transmitted through sheep by means of *G. morsitans*, 24 passages having been made up to May 1938. At the 13th passage, in October 1936, a branch line through antelopes was begun. Infective flies were isolated by feeding them singly on white rats and were used to infect man and various animals, including white rats. Inoculations of white rats were also made from time to time from infected animals and man. In all, 177 white rats were infected by inoculation from 58 vertebrate hosts, consisting of 17 men, 27 sheep, 9 monkeys and 5 antelopes; and 197 rats were bitten and infected by 80 isolated infective *G. morsitans*, which had become infected by feeding on 19 vertebrate hosts consisting of 1 man, 9 sheep and 9 antelopes. The blood of the rats was examined, but the virulence of the strain was estimated from the life of the rats and, to a less degree, by the incubation period.

The following are the conclusions :—

" White rats were used as test animals in an experiment to see whether a strain of *T. rhodesiense* would lose its infectivity to man or undergo other changes in its characters during maintenance in ruminant animals. The rats were infected by the bites of isolated *G. morsitans* and also by inoculation from the infected animals and volunteers. No change in virulence was observed.

" The infections in rats produced by inoculation and by the bites of flies which had fed on the same hosts were similar, but those produced by the flies appeared to be rather more acute.

" The infections of a reedbuck and a Thomson's gazelle were apparently similar, as tested in white rats; but when *G. morsitans* were fed on these animals those which fed on the reedbuck showed a large proportion with infected salivary glands, while no fly with infected salivary glands was found among those which fed on the gazelle." *W. Y.*

Corson (J. F.). **The Cerebrospinal Fluid of Monkeys** (*Cercopithecus* **sp.) infected with a Strain of** *Trypanosoma rhodesiense.*—*Ann. Trop. Med. & Parasit.* 1938. Aug. 2. Vol. 32. No. 2. pp. 197–199.

Reference is made to the fact that Peruzzi (1928) [see also this *Bulletin*, 1928, Vol. 25, p. 771] found trypanosomes in the cerebrospinal fluid of three monkeys (*Cercopithecus* sp.) between the 26th and 31st day of infection with *T. rhodesiense*.

During the year March 1937 to March 1938, monkeys of the same species as those used by Peruzzi were infected at Tinde with a strain of *T. rhodesiense*, which was being maintained in various antelopes by means of cyclical transmission by *Glossina morsitans*. The monkeys were infected by flies fed on antelopes. As it was at first intended to note the duration of life of the monkeys, observations to find the dates of infection of the cerebrospinal fluid were not made, but the cerebrospinal fluid was examined in some of the monkeys and the trypanosomes and leucocytes were counted. The duration of the disease was reckoned from the day on which trypanosomes were found in the monkey's blood, as the exact date of infection was unknown, but the incubation period of the strain in question in these monkeys was usually 4 to 7 days.

The results of the examination of the cerebrospinal fluid of 27 such monkeys are given in a Table. In all but two of the animals the duration of the disease was between 2 and 7 months. In the remaining two it was 19 days and 1½ months, respectively. In 19 of the 27 animals trypanosomes were found sometimes in large numbers by direct examination, and in 3 of the 8 negative cases their presence was demonstrated by inoculation of the cerebrospinal fluid into rats. The leucocyte count was greatly increased in all but one of the 27 monkeys.

It is interesting to note that the animal in which the duration of the disease was only 19 days contained trypanosomes in the cerebrospinal fluid, and that subinoculated rats became infected and the leucocyte count was 211 per cmm.

The author compares these results with some observations that have been made on man, particularly those of KEEVILL [this *Bulletin*, 1928, Vol. 25, p. 795] and of MACLEAN and FAIRBAIRN [this *Bulletin*, 1933, Vol. 30. p. 108]. The general conclusion is that the cerebrospinal fluid may contain trypanosomes very soon after a person becomes infected, and that consequently very early diagnosis and treatment are of importance. *W. Y.*

VAN HOOF (L.), HENRARD (C.) & PEEL (E.). **The Stability of Bayer 205 Resistance in** *Trypanosoma gambiense*.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1938. Aug. 25. Vol. 32. No. 2. pp. 197–208.

The authors have investigated the stability of Bayer 205 resistance in *T. gambiense*. MURGATROYD and YORKE [this *Bulletin*, 1937, Vol. 34, p. 532], working with *T. rhodesiense* and *T. brucei*, have shown that Bayer-resistance is very slow to develop, and that the *rhodesiense* strain lost its Bayer-resistance after repeated mechanical transmission through mice, but that the *brucei* strain kept its resistance unaltered after one cyclical passage through *G. morsitans*.

The work of van Hoof, Henrard and Peel with *T. gambiense* generally confirms that of Murgatroyd and the reviewer, except that van Hoof and his colleagues observe a definite loss of Bayer-resistance after a cyclical transmission through the tsetse fly.

The following summary is given :—

"It has been shown how *Trypanosoma gambiense*, either a susceptible strain or an arsenic-resistant one, may be rendered resistant to Bayer 205. The experience acquired while treating numerous patients has proved that from time to time trypanosomes are found which are naturally resistant to 0·01 gramme but hardly ever to 0·02 gramme per kg. No strain has yet been isolated that did not respond to 0·10 gramme per kg. It must be concluded, therefore, that the Gemena strain had undergone true modifications.

"MURGATROYD and YORKE (1937) have been able to prove that successive mechanical passages reduce drug-resistance till it completely disappears. Their investigations extended over a period of 4 years during which a considerable number of passages through mice were made. The observations conducted at the Laboratory of Leopoldville were discontinued as soon as it was noted that passage through guineapigs was bringing about a decrease in Bayer-resistance, and the conclusions of these authors had been confirmed. It was further established that transmission through a different host, such as the monkey, considerably accelerates the loss of Bayer-resistance.

"From the practical point of view, of prophylaxis of sleeping-sickness caused by *Trypanosoma gambiense*, this loss of resistance is of much less

importance than that following cyclical transmissions, to test the influence of which cyclical passages were made from monkey to guineapigs or from guineapig to guineapig. In opposition to the observations of Murgatroyd and Yorke it was found that transmission through the tsetse-fly considerably decreased Bayer-resistance. It may therefore be stated :—

" 1. Drug-resistance of *T. gambiense* to Bayer 205 is an unstable character which progressively decreases on mechanical passages through mammals of the same species, decreases more rapidly still on mechanical passages through mammals of different species and even completely disappears on cyclical transmission through *Glossina palpalis*.

" 2. In the epidemiology of Gambian sleeping-sickness resistance to Bayer 205 is of considerably less importance than the corresponding arsenic-resistance." *W. Y.*

Launoy (L.) & Lagodsky (H.). Etude de la stibio-résistance, secondaire à l'arséno-résistance, acquise par *Trypanosoma annamense*. [**Study of Antimony-Resistance, Secondary to Arsenic-Resistance, acquired by** *T. annamense*.]—*Bull. Soc. Path. Exot.* 1938. Nov. 9. Vol. 31. No. 9. pp. 866–874.

In a previous paper [this *Bulletin*, 1937, Vol. 34, p. 929; and 1938, Vol. 35, p. 350] the authors have shown that in mice a strain of *T. annamense*, made resistant to tryparsamide, was less sensitive, than the normal strain, to the action of aminophenylstibinate of methylglucamine.

In the present work the authors have repeated their observations on rabbits infected with the normal and resistant strains, respectively. They reach the general conclusion that the tryparsamide-resistant strain is less sensitive to antimony than is the normal strain.

W. Y.

Launoy (L.). Distinction entre la chimio-résistance naturelle présentée par *Trypanosoma congolense* et la chimio-résistance acquise par *Trypanosoma annamense*. [**Distinction between the Natural Chemo-Resistance exhibited by** *T. congolense* **and the Chemo-Resistance acquired by** *T. annamense*.]—*Bull. Soc. Path. Exot.* 1938. July 6. Vol. 31. No. 7. pp. 618–621.

In a previous paper [this *Bulletin*, 1938, Vol. 35, p. 350] the conclusion was reached that *T. congolense* and a chemo-resistant strain of *T. annamense* were equally sensitive to aminophenylstibinate of methylglucamine. This observation led the author to enquire whether the natural resistance to drugs exhibited by certain trypanosomes is identical with the resistance acquired by other trypanosomes as the result of exposure to drugs. The present paper deals with this problem.

In a Table, Launoy contrasts the minimum effective dose, the curative dose and the toxic dose of the various compounds for mice infected with the normal and resistant strains of *T. annamense* and with *T. congolense* respectively. The compounds used were the acridine derivative gonacrine, moranyl, tryparsamide, the pentavalent antimonials, p. aminophenyl stibinate of methyl glucamine 23, and carbamido diphenyl distibinate of methyl glucamine, and p. aminophenyl stibinate of methylglucamine 33, and the trivalent antimonial anthiomaline (antimony III thiomalate of lithium).

It was found that *T. congolense* and the chemo-resistant strain of *T. annamense* responded similarly to the pentavalent antimonials and also to the acridine derivative gonacrine and to tryparsamide. On the other hand, the resistant strain of *T. annamense* was more sensitive to the trivalent antimonial anthiomaline and to moranyl than was *T. congolense*. From this it appears that the natural chemo-resistance of *T. congolense* is not identical with the artificial chemo-resistance of *T. annamense*. *W. Y.*

Halberstaedter (L.). **The Effect of X-Rays on Trypanosomes.**—Reprinted from *Brit. Jl. Radiology*. 1938. Apr. Vol. 11. N.S. No. 124. pp. 267–270.

In an earlier experiment with X-rays and radium, the author did not succeed in reaching doses sufficiently high to kill the trypanosomes outright and, furthermore, the doses employed could not be accurately measured. In the work described in the present paper it has been possible to carry the matter further.

For irradiation Halberstaedter used the blood of a mouse heavily infected with *T. gambiense* and suitably diluted with normal saline. One drop of the mixture was placed in a hollow slide and covered with a 0·03 mm. mica coverslip. The tube was placed at a distance of 3·5 cm. at which the intensity of the irradiation was *ca.* 120,000 r/min. Immediately after irradiation the motility of the trypanosomes was determined microscopically and normal mice were inoculated subcutaneously with the irradiated material. In some cases the trypanosome suspension was diluted with equal parts of normal saline and guineapig serum and placed in the refrigerator at 6°C. for 24 hours, when their motility was tested again.

Generally speaking, the trypanosomes retain good motility at 100,000 r. At *ca.* 200,000 r a few organisms had already lost motility; at *ca.* 300,000 r a larger number had lost their motility and normal outline, and at *ca.* 400,000 r most individuals showed these changes, but some were still unaffected. All the trypanosomes in the drop were deformed at 600,000 r.

It thus appears that the direct lethal dose is not the same for all the individuals, variation occurring between 100,000 r and 600,000 r. Approximately the same results were obtained with the non-parasitic protozoa, Paramecia. Roughly 1/50 of the direct lethal dose is required to suppress normal division and therefore infectivity.

W. Y.

Jahnel (F.). Ueber das Ueberleben von Trypanosomen und Rekurrensspirochäten nach Abkühlung in flüssigem Helium bis auf −269,5°C,d.i. 3,7° vom absoluten Nullpunkt entfernt. [**The Survival of Trypanosomes and Relapsing Fever Spirochaetes after Cooling in Fluid Helium to −269·5°C.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1938. Nov. 8. Vol. 94. No. 3/4. pp. 328–341. [12 refs.]

The blood and liver of two mice infected with *T. equiperdum*, and the blood, spleen and liver of two mice infected with *Sp. recurrentis* were exposed in fluid helium for 3 hours at a temperature of −269·5°C. and for a further 2 hours at −269°C. The degree of cold was thus only 3·7° and 4·2°C. above absolute zero. Mice subsequently inoculated

with the trypanosomes and spirochaetes thus cooled became infected. It follows, therefore, that the parasites had survived a fall in temperature (from the body temperature) of over 300°C. *W. Y.*

CARPANO (Matteo). Sulla morfologia dei tripanosomidi in rapporto all'ambiente. [**Morphology of Trypanosomes in Relation to Environment.**]—*Riv. di Parassit.* Rome. 1938. May. Vol. 2. No. 2. pp. 81–90. With 1 plate. [11 refs.] English summary (10 lines).

Having encountered various cultural forms of *Trypanosoma theileri* in haemorrhagic lesions of the brain of an ox and later in a similar lesion of a lymphatic gland of another ox, the author reflects that, as regards the tendency to invade the blood stream or tissues, trypanosomes can be arranged in series from those forms which are essentially blood parasites (*T. evansi* and *T. vivax*) to the leishmanias which are almost exclusively tissue parasites. *C. M. Wenyon.*

GHIDINI (Gian Maria). Le glossine dell'Africa Orientale Italiana. [**The Tsetse Flies of Italian East Africa.**]—*Riv. di Biol. Colon.* 1938. Feb. Vol. 1. No. 1. pp. 53–71. With 6 figs. [15 refs.] English summary (5 lines).

The paper extends our limited knowledge of the distribution of *Glossina* in Abyssinia and Italian Somaliland.

Among the new records published perhaps that of *G. morsitans* on the R. Didessa (a tributary of the Blue Nile, about 9°N.) is the most interesting. Recent work has added to our knowledge of *Glossina* in Italian Somaliland, particularly in the valley of the R. Juba. There is no extension of the range of *G. palpalis* since it was collected by BRUMPT in the valley of the R. Omo, which flows into the north end of Lake Rudolph. Other species recorded are *G. longipennis*, *brevipalpis*, *austeni* and *pallidipes*.

Much of the country is arid, and it seems that the tsetse flies are extremely localized, at least in most areas. The highlands of Abyssinia are (presumably) free of *Glossina*, but the upper limit of altitude is not yet known. The paper gives no information on one most curious riddle. *G. tachinoides* is a West African species, its eastern limit being on the Shari River about 18°E. But it also occurs in Southern Arabia in the hills behind Aden, the gap in its range being about 27°, say 1,600 miles. The present paper contains no record of *tachinoides* (which one might expect to be found in some part of the area under review). The old record of *morsitans* from Massaua is, quite rightly, discredited. One is probably correct in thinking that the Red Sea littoral (British and Italian) is too dry for any species of *Glossina*.

The paper includes some indefinite remarks, but no facts, about human and animal trypanosomiasis. The author provides a key to local species and figures of certain diagnostic points. *P. A. Buxton.*

TALIAFERRO (William H.). **Ablastic and Trypanocidal Antibodies against** *Trypanosoma duttoni*.—*Jl. Immunology*. 1938. Oct. Vol. 35. No. 4. pp. 303–328. [27 refs.]

The non-pathogenic trypanosomes of rodents present a number of immunological problems of peculiar interest. These infections are

characterized by an initial period of rapid reproduction of the parasites followed by a period during which reproduction is either completely inhibited or greatly reduced, and they are generally terminated by self-cure with a subsequent immunity of variable length.

In previous work [this *Bulletin*, 1933, Vol. 30, p. 122] the author has shown that this peculiar development in *T. lewisi* is associated with the formation of two antibodies. The inhibition of reproduction is associated with a passively transferable antibody, termed ablastin, which has the specific property of inhibiting reproduction of the organisms; it possesses many of the classical features of ordinary antibodies, but it exhibits no marked *in vitro* affinity for the organisms. The termination of the infection is associated with a trypanocidal antibody, which shows all the classical characteristics of antibodies in general. As the reproduction-inhibiting antibody has been demonstrated serologically only in infections with *T. lewisi*, Taliaferro considered it to be of interest to ascertain whether it is present in an infection with another trypanosome. The matter has been studied in the case of *T. duttoni* of the mouse, and the *duttoni* and *lewisi* antibodies are compared by various homologous and heterologous tests. The technique and results of the experiments are described in detail. The following are the conclusions :—

"1. The inhibition of reproduction of *T. duttoni* after 10 to 12 days in the mouse is brought about by a specific ablastin found in immune mouse-serum, which is similar to that described in *T. lewisi* infections in the rat, and is passively transferable.

"2. The eventual self-cure (to the extent that no trypanosomes are found in the peripheral blood) is associated with a specific trypanocidal antibody, which is passively transferable and behaves as a typical trypanolysin.

"3. A group-reaction can be demonstrated between *T. duttoni* and *T. lewisi* and their ablastins, *in vivo*, and between *T. lewisi* and the anti-*duttoni* trypanocidal antibody, *in vivo* and somewhat weakly *in vitro*. Whether the reaction of anti*lewisi* trypanocidal antibody against *T. duttoni in vivo* and *in vitro* is a true group-reaction of an immune anti*lewisi* antibody is not evident because normal rat-serum is also trypanocidal against *T. duttoni*." *W. Y.*

FRENCH (M. H.). **Studies in Animal Trypanosomiases. IV. The Effect of *Trypanosoma congolense* and *Trypanosoma brucei* on Some Inorganic Blood Constituents.**—*Jl. Comp. Path. & Therap.* 1938. June. Vol. 51. Pt. 2. pp. 119–127. [18 refs.]

In a previous paper [this *Bulletin*, 1938, Vol. 35, p. 712] the author has shown that *T. congolense* and *T. brucei* infections of cattle and sheep cause a loss of body tissues and an increased rate of excretion of body bases, chlorides and phosphates.

The present paper summarizes the changes in the blood sodium, potassium, calcium, chlorine and inorganic phosphorus caused by *T. congolense* and *T. brucei* infections in cattle, sheep and donkeys.

The author summarizes his conclusions as follows :—

"1. The inorganic phosphorus content of the blood was unchanged by trypanosome infections in cattle, sheep and donkeys.

"2. The blood calcium was unaltered in several cases of trypanosome infections, but showed a tendency to decrease in other cases. Interpretation of the calcium changes is therefore difficult.

"3. The potassium content of whole blood fell during trypanosomiasis, the fall being attributable to the anaemic conditions of the blood reducing the proportion of blood cells to blood plasma.

"4. The sodium content of whole blood increased during infections, the increase being caused by the increased proportions of plasma in the anaemic blood of the infected animal.

"5. Blood chlorine increased during infections up to death or crisis, this increase also being caused by the anaemic conditions of the blood."

W. Y.

French (M. H.). **Studies in Animal Trypanosomiases. Part II.—Disturbances produced in the Plasma Proteins of** *Trypanosoma congolense* **and** *Trypanosoma brucei*.—*Jl. Comp. Path. & Therap.* 1938. Sept. Vol. 51. Pt. 3. pp. 192–196.

This note consists of the protocols in tabular form of the observations on which French based the conclusions recorded in his previous paper [this *Bulletin*, 1938, Vol. 35, p. 712]. *W. Y.*

Fournials. Des erreurs de diagnostic en matière de trypanosomiase. [**Errors of Diagnosis in Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1938. Oct. 12. Vol. 31. No. 8. pp. 772–781.

The fact that native soldiers and others may become infected with trypanosomiasis in Africa and show no signs of the disease until after their return to France is apt to be overlooked, and consequently may cause the real nature of the case to escape recognition. The author illustrates his point by giving clinical details of 24 patients admitted to hospital at Marseilles. *W. Y.*

Guibert (J.) & Boscq (H.). Présence constante chez les trypanosomés non traités ou non guéris de *Trypanosoma gambiense* dans la moelle osseuse. Résultats de 38 nouvelles ponctions du sternum. [**The Constant Presence of** *T. gambiense* **in the Bone Marrow in Untreated or Uncured Cases of Trypanosomiasis.**]—*Ann. de Méd. et de Pharm. Colon.* 1938. Apr.–May–June. Vol. 36. No. 2. pp. 525–532. With 3 figs.

The authors have continued their investigations on examination of the bone-marrow as a method of diagnosis in trypanosomiasis [this *Bulletin*, 1938, Vol. 35, p. 704]. In the present paper details of the examination of 38 further cases by this method are given. The patients are divided into three groups :—

1. New cases which have never been treated.
2. Very suspicious cases of trypanosomiasis.
3. Cases which have been passed as cured in 1934 and 1935, and who have come up because they felt ill again.

The results are set out in Tables, which also give information regarding the examination of the gland juice, thick blood films, and cerebrospinal fluid. Of the 30 cases falling into Group I, *i.e.*, new untreated cases with trypanosomes in the blood, 29 showed trypanosomes in the bone-marrow. The authors consider that the explanation of the failure to find trypanosomes in the remaining case was due to

poor technique, the puncture yielding a very minute quantity of bone-marrow. Of the six cases belonging to Group 2, in all of whom the gland juice and blood examinations were negative, one showed trypanosomes in the bone-marrow; of the two cases belonging to Group 3, the bone-marrow of one was positive.

The authors claim that these observations support their previous contention that bone-marrow examination is of diagnostic value in trypanosomiasis. *W. Y.*

i. Jospin & Gallais. Diagnostic par la ponction sternale d'une forme mentale pure de trypanosomiase humaine. (Intérêt de ce procédé d'exploration dans certaines maladies à protozoaires.) [**Diagnosis by Sternal Puncture in a Mental Case of Sleeping Sickness. (Interest of this Method of Exploration in Certain Protozoal Diseases.**)]—*Bull. Soc. Path. Exot.* 1938. Oct. 12. Vol. 31. No. 8. pp. 710–713.

ii. Thiroux (A.). Diagnostic par la ponction sternale d'une forme mentale pure de trypanosomiase humaine. A propos de la communication de MM. Jospin et Gallais. [**Diagnosis by Sternal Puncture in a Mental Case of Sleeping Sickness. A propos of the Communication of Jospin and Gallais.**]—*Ibid.* Nov. 9. Vol. 31. No. 9. p. 787.

i. Clinical details are given of a patient from the Ivory Coast who had been 14 months in France. The patient suffered from mental disturbances accompanied by signs suggestive of trypanosomiasis, including a meningeal reaction with excess of cells and albumen. All attempts to discover the trypanosome by the ordinary methods failed; sternal puncture, however, at once revealed fairly numerous trypanosomes.

It is an interesting question why the trypanosomes were so easily found in the bone marrow and apparently absent from the blood. In another patient who had *Mf. perstans* in his blood, the bone marrow was negative, and in still another, thick blood films had been consistently negative for 10 days, but the bone marrow exhibited plentiful *P. praecox* [*P. falciparum*].

ii. After referring to the above-mentioned observations of Jospin and Gallais, Thiroux states that he has succeeded in infecting *Cercopithecus patas* with the blood of patients when a search for trypanosomes by the method of triple centrifugation had failed. It follows, therefore, that the injection of a *Cercopithecus* is a more delicate method of examining the blood than is triple centrifugation. Thiroux does not wish to belittle the observations of Jospin and Gallais, but he considers that it would be of interest to know whether in such cases as that described by these authors, the blood was really negative or only apparently so. *W. Y.*

Brown (H. C.) & Broom (J. C.). **Studies in Trypanosomiasis. II. Observations on the Red Cell Adhesion Test.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1938. Aug. 25. Vol. 32. No. 2. pp. 209–222. With 2 figs. [16 refs.]

The Red Cell Adhesion test is a specific, serological reaction, and consists in incubating together trypanosomes, immune serum, complement

and human red blood corpuscles. If the serum is homologous, the red cells become firmly adherent to the trypanosomes.

The authors state that when they were using this test for the study of the serology of strains of *T. brucei*, which had been transmitted cyclically through tsetse flies, they obtained irregular and unrepeatable results from time to time. The present investigation was consequently undertaken in order to obtain some light on the explanation of these irregular results. The following conclusions were reached :—

" 1. We have shown that standard concentrations both of red cells and of trypanosomes are necessary in order to obtain constant results in the Red Cell Adhesion test.

" 2. The character of adhesion obtained can be varied at will by altering the relative proportions of the various reagents or the time of incubation.

" 3. Agglomeration and lysis of trypanosomes take place, in presence of homologous serum, when other conditions necessary for adhesion are not present, *e.g.*, an unsuitable indicator (red cells or bacteria).

" 4. The necessity for the presence of complement in this test has been confirmed and it is shown that the absence of any single component of complement inhibits the reaction.

" 5. The end titre of an immune serum has shown only slight variations when repeatedly examined by the adhesion test.

" 6. Certain human red cells will not adhere to sensitized trypanosomes.

" 7. This condition is met with both in pathological conditions and in normal individuals. We have been unable to correlate it with any altered physical state of the red cell.

" 8. In the same way certain bacteria adhere to sensitized trypanosomes and others fail to do so. This is not correlated with rough and smooth states of the culture."

W. Y.

Brown (H. C.). **Some Observations on the Electric Charges of Micro-organisms.**—Reprinted from *Scient. Jl. Roy. College of Science.* 1938. Vol. 8. pp. 52–57. With 3 figs.

The object of this address was to give a general idea of the subject, and to discuss some of its simpler applications.

When particles are suspended in a fluid through which an electric current is passed, they will travel either to the positive or negative pole, according to the sign of the charge which they carry ; moreover, their rate of migration will be directly proportional to the magnitude of the charge. The phenomenon can be studied by making use of a microcataphoresis cell, which is described and figured.

Various observers have from time to time attempted to determine the size of the charge carried by trypanosomes when suspended in different fluids. The results have been extremely contradictory, some of the observers stating that the flagellates carry a negative charge, whilst others assert that they are positively charged. According to Brown, the technique used by these observers is open to criticism. In his own experiments he has employed a medium of *p*H 7·2 consisting of one volume of physiological saline and nine volumes of 4 per cent. glucose in freshly boiled distilled water. In such a medium the following results were obtained :—

Charge of the Insect Forms.—The developmental stages of the sheep trypanosome, *T. melophagium*, in its insect vector, *Melophagus ovinus*, proved to be negatively charged.

Charge of the Cultural Forms.—Cultural forms of *T. lewisi* and *T. cruzi* were always found to be negatively charged.

Charge of the Blood Forms.—In the earlier experiments which were made on the charge of the various species of trypanosomes in mice, rats and guineapigs, it was found that some strains were positive, some negative, and that others showed both positive and negative individuals in the same animal. It was not until the same animals were examined day after day that the explanation of these earlier findings was understood.

In the case of the polymorphic trypanosomes, it was found that when a relapse occurs after a spontaneous cure in mice, a reversal of the sign of the charge of the trypanosome invariably takes place.

The nature of the host has apparently a definite effect upon the sign of the charge of the trypanosome. If negatively charged trypanosomes from a mouse are injected into a more resistant animal, such as a guineapig or rat, it is found that as soon as the infection in this animal is manifest, the trypanosome will almost invariably have changed its charge, whereas when the trypanosome is passed from mouse to mouse the charge remains constant.

With the object of overcoming certain technical difficulties due to the use of the cataphoresis cell, Brown has advised a simple test for finding the sign of the charge of the trypanosomes. The test consists in adding 0·02 cc. of infected blood to 0·3 cc. of a solution consisting of one volume of normal saline and nine volumes of 4 per cent. glucose. After being allowed to stand at room temperature for a few minutes, the suspension is examined under the microscope with a $\frac{1}{6}$th inch objective. When the trypanosomes are positively charged they will be seen to be firmly adherent to the red cells either singly or in groups, whereas negatively charged trypanosomes are perfectly free and non-adherent.

Certain experiments were conducted with *T. evansi*, which showed very distinct differences in the susceptibility of the positively and negatively charged variants to the action of arsenical drugs. It was found that the positively charged variant is distinctly more susceptible to the action of the negatively charged ion of tryparsamide. Brown adds that so far he has been unable to obtain similar results with other species of trypanosomes. *W. Y.*

PARKIN (B. S.). **Auto-Sterilization in Trypanosomiases.**—*Onderstepoort Jl. Vet. Sci. & Animal Industry.* 1938. Jan. Vol. 10. No. 1. pp. 21–27.

In the course of experiments on the chemotherapy of infections due to *T. congolense* and *T. vivax*, it was observed that infected animals, some considerable time after treatment or even without treatment, made spontaneous recoveries. The purpose of the present article is to record various instances of spontaneous recovery observed by the author. Details are given in tables.

A number of cases of sterilization was noted in *T. vivax* infections of bovines and in *T. congolense* infections of bovines and ovines, but no such cases were observed in *T. brucei* or *T. equiperdum* infections of equines. *W. Y.*

MASSEGUIN. Quelques règles de traitement à propos de la maladie du sommeil. [**Rules for the Treatment of Sleeping Sickness.**]—*Marseille-Méd.* 1938. Sept. 5–15. Vol. 75. No. 25–26. pp. 253–260.

A general account of the treatment of sleeping sickness, apparently written for the guidance of physicians in France. It contains nothing new and requires no notice here. *W. Y.*

HAWKING (Frank). **Analysis of the Trypanocidal Action of Trivalent Arsenicals and Acriflavine.**—*Ann. Trop. Med. & Parasit.* 1938. Oct. 12. Vol. 32. No. 3. pp. 313–331. With 6 figs. [14 refs.]

It has been shown by the reviewer and his colleagues, and also by JANCSÓ and others, that normal trypanosomes readily absorb trivalent arsenicals when exposed to dilute solutions of these compounds; atoxyl-fast trypanosomes absorb them much less readily, and it is now considered that this explains the phenomenon of drug-resistance.

In the present paper, which is of a technical nature and must be consulted in the original by those interested, Hawking attempts to analyse the combination between drug and trypanosome in greater detail and to investigate its relation to the eventual death of the parasite.

The following summary is given :—

" 1. Time-action curves for the trypanocidal action of trivalent arsenicals and acriflavine show that there is a constant death-rate, following an initial lag which is much longer than the time required for fixation of the compound.

" 2. Time-concentration curves show that the trypanocidal action follows the equation $(C—C_o)^n t=k$, where n is 0·5–0·8, except in the case of phenylarsenoxide (1·04).

" 3. From analogy with other pharmacological processes, it is probable that the reaction between drug and trypanosome occurs in three stages, viz., fixation of the drug, secondary chemical reactions, and eventual death of the organism. The fixation occurs rapidly, being complete in a few minutes, and is reversible. The earlier part of the secondary chemical reactions is also reversible. The temperature coefficient (Q/10) of the whole trypanocidal process is 1·8.

" 4. When equilibrium has been reached between drug inside and outside the trypanosome, the partition-ratio (*i.e.*, concentration inside trypanosome/concentration outside trypanosome) of reduced tryparsamide is about 5,000 for normal trypanosomes and 5 for resistant ones; for phenylarsenoxide it is about 10,000, for arsenophenylglycine about 50, for sodium arsenite 30–100, and for tartar emetic about 200.

" 5. The relation between the concentrations of acriflavine inside and outside normal trypanosomes respectively approximates to Langmuir's equation for adsorption, viz., $kx=\frac{y}{B-y}$. With low concentrations this gives a constant ratio (partition-ratio) between the internal and external concentrations respectively, viz., 8,000. When normal trypanosomes are saturated with acriflavine they contain drug equivalent to 3 per cent. of their own (moist) weight.

" 6. The absorption of acriflavine by resistant trypanosomes shows a similar relationship with the lower concentrations, but the partition-ratio is only 60. With higher concentrations the relationship is distorted by the fact that the death of resistant trypanosomes is accompanied by an increase in their powers of absorption.

" 7. The amount of reduced tryparsamide required to kill a normal trypanosome in three hours is about $8 \times 10^{-9}\gamma$, which is sufficient to form

a monomolecular film over only 5 per cent. of its surface. The corresponding amount of acriflavine is $9 \times 10^{-8}\gamma$, which is sufficient to cover the whole surface."

W. Y.

King (H.), Lourie (E. M.) & Yorke (Warrington). **Studies in Chemotherapy. XIX. Further Report on New Trypanocidal Substances.** —*Ann. Trop. Med. & Parasit.* 1938. Aug. 2. Vol. 32. No. 2. pp. 177–192.

This communication amplifies the earlier results obtained by the authors in their examination of a considerable number of guanidines, isothioureas, amidines and amines, with alkyl and alkylene chains.

The following summary is given :—

"1. The investigation described in this paper was instigated by the discovery that synthalin has a powerful direct trypanocidal action.

"2. A considerable number of guanidines, isothioureas, amidines and amines, with alkyl and alkylene chains, were prepared and examined for trypanocidal activity.

"3. It was found that certain of the diamidines exhibit a powerful trypanocidal action *in vitro*, and that with the most active member of the series, viz., n. undecane-1 : 11-diamidine, it is possible to produce permanent cures in approximately 100 per cent. of mice and rabbits infected with our laboratory strain of *T. rhodesiense*.

"4. Undecane diamidine had little curative action on mice infected with *T. congolense*, but when given in large doses on the day of inoculation and on the following nine days it exhibited a pronounced prophylactic action.

"5. This compound had no action on *T. cruzi* infections in mice, or on mice infected with *Spirochaeta recurrentis* or *Spirillum minus*.

"6. It has a definite action on human simple tertian malaria, causing the parasites to disappear from the peripheral blood and the febrile paroxysms to cease.

"7. The structural feature common to all the compounds referred to above is the possession of a central inert carbon chain with terminal polar groups of strongly basic nature.

"8. As it seemed possible that this carbon chain merely served as a carrier of the active groupings, and might be replaced by an inert aromatic structure of approximately the same molecular weight, a number of aromatic amidine and guanidine compounds were prepared.

"9. Several of these aromatic compounds were found to exhibit pronounced trypanocidal action *in vitro*, and with three of them, viz., pp′-diguanidino-diphenyl-methane, pp′-diamidino-diphenyl-methane, and 2 : 7-naphthalene diamidine, it was found possible to cure mice infected with *T. rhodesiense*.

"10. This work opens up a new field in the search for substances of therapeutic value against trypanosomal and malarial infections.

[See also this *Bulletin*, 1938, Vol. 35, p. 658.]

W. Y.

Lourie (E. M.) & Yorke (Warrington). **Studies in Chemotherapy. XX. The Preparation of Strains of Trypanosomes resistant to Synthalin and Undecane Diamidine, and an Analysis of their Characters.**—*Ann. Trop. Med. & Parasit.* 1938. Aug. 2. Vol. 32. No. 2. pp. 201–213.

In this paper the authors describe the preparation of strains of trypanosomes resistant to synthalin and undecane diamidine. The

characters of these strains are compared with those of strains of the same trypanosome previously made resistant to the aromatic arsenical and antimonial compounds, to tartar emetic, acriflavine, and to Bayer 205, respectively.

The following summary is given :—

" 1. The preparation of strains of *T. rhodesiense* resistant to synthalin and to n. undecane-1 : 11-diamidine respectively is described in detail.

" 2. The development of synthalin- and undecane diamidine-resistance is a slow process as compared with the development of resistance to the aromatic compounds of arsenic or antimony or to acriflavine.

" 3. The characters of these two strains were examined and compared with those of strains of the same trypanosome which had been made resistant to tryparsamide and to Bayer 205 respectively.

" 4. It was found that the synthalin- and undecane diamidine-resistant strains are indistinguishable from one another in that they are both resistant to each of these drugs and to pp′-diguanidino-diphenylmethane and naphthalene-2 : 7-diamidine. Both these strains are, however, as sensitive to Bayer 205 and to halarsol as is the normal parent strain ; and, conversely, the Bayer 205- and tryparsamide-resistant strains are just as sensitive to undecane diamidine as is the normal parent strain.

" 5. The characters of the four different types of resistance to therapeutic substances which we have developed in *T. rhodesiense* are discussed. These types of resistance are :

" (*a*) Resistance to the aromatic compounds of arsenic and antimony and to acriflavine.

" (*b*) Superadded tartar emetic-resistance.

" (*c*) Resistance to Bayer 205.

" (*d*) Resistance to the amidine and guanidine compounds.

" Each of these types of resistance is specific for its own group of chemical compounds."

W. Y.

VAN RENSBURG (S. W. J.). **Surfen C. Therapy in *Trypanosoma congolense* Infection in Bovines and Ovines.**—*Onderstepoort Jl. Vet. Sci. & Animal Industry.* 1938. Jan. Vol. 10. No. 1. pp. 13–20.

Prior to the advent of antimosan the only drug of any value for the treatment of *T. congolense* infections of cattle and sheep was tartar emetic. Owing to its ease of administration antimosan is immeasurably superior to tartar emetic, and PARKIN in 1930 concluded that bovines infected with *T. congolense* could be sterilized by the subcutaneous injections of 3 gm. of antimosan given at four weekly intervals.

When Surfen C appeared a claim was made that a single dose of about 10 mgm. per kilo of body weight, given either intramuscularly or subcutaneously, proved a certain sterilizing dose in animals infected with *T. congolense*. The author writes that Surfen C has now been subjected to tests in various parts of Africa, but the reports regarding its efficacy and local tolerability are conflicting.

A summary is given of the more important results hitherto obtained. This is followed by a description of the author's experiments on cattle and sheep artificially infected with various strains of *T. congolense*.

The general conclusions reached are that the intramuscular injections of Surfen C into bovines caused serious local reaction, and that the treatment of bovines and ovines infected with *T. congolense* by Surfen C was ineffective. *W. Y.*

Biozzi (Silvio). Azione delle acque oligodinamiche e di alcuni preparati di metalli colloidali sulla infezione sperimentale da *Castellanella brucei*. [**Action of Oligodynamic Waters and of Certain Preparations of Colloidal Metals on Experimental *Trypanosoma brucei* Infections.**]—*Riv. di Parassit.* Rome. 1938. May. Vol. 2. No. 2. pp. 95–110. With 4 figs. on 1 plate. [17 refs.] English summary (5 lines).

Testing oligodynamic watery solutions of zinc, silver and copper and two colloidal preparations (zimocuprol and cupridol) on *Trypanosoma brucei* infections in guineapigs, the author finds that they possess distinct therapeutic properties. The four illustrations showing infected blood before and after treatment have been all incorrectly labelled. *C. M. Wenyon.*

Brown (Arthur A. Forbes). **Trypanosomiasis Gambiensis. Some Observations in Uganda and their Bearing on Prophylaxis.**—*Jl. Trop. Med. & Hyg.* 1938. June 15, July 1 &15, Aug. 1 & 15, Sept. 1 & 15. Vol. 41. Nos. 12, 13, 14, 15, 16, 17 & 18. pp. 200–207; 220–222; 234–237; 247–251; 265–270; 281–286; 296–301. With 12 figs. (1 map). [47 refs.]

As the author writes in the introductory remarks which precede this long series of articles, they cannot be held to contain anything new, and whatever is advocated in them has already been stressed by others. One of the author's reasons for bringing up certain methods of prophylaxis is that close co-operation between the medical man and the local administration is an absolute essential.

In the West Nile, the focus of sleeping sickness at Aringa has been a problem for years and the cause of much dispute between the Medical Officer and the Administrator. Out of the turmoil a combined scheme for dealing with the situation was eventually decided upon.

The author summarizes his conclusions in the following terms :—

" (1) In the West Nile, an equilibrium has now reached a stage nearing perfection, between *T. gambiense*, man, and *G. palpalis*. This allows the trypanosome a placid existence in its human host, and in *G. palpalis* polymorphic trypanosomes develop cyclically to give a salivary-gland infection of not less than 0·6 per cent. The balance is not yet perfect because (*a*) the disease, though mild, is still fatal; (*b*) salivary-gland infections are attenuated.

" (2) Owing to the suitability of man nowadays to an adapted trypanosome, symptomless human reservoirs are numerous, and owing to the complexity of rivers, widespread infection is inevitable, *i.e.*, the degree of balance attained is actually more troublesome than if it did not exist.

" (3) The fly population of all rivers is small; abrupt variations in water volume, by destroying pupae, will never allow it to increase. *G. palpalis* is forced to live precariously; conditions are so unfavourable that it seldom can leave the river beds, and it is not sufficiently hardy to survive other than by a small margin. Narrow strip debushing thus can alter conditions so as to prevent its further existence.

" (4) Administrative measures must aim at: (*a*) Quarterly inspection of the population. (*b*) Continuation of examination by suitably placed microscope posts. (*c*) Modified resettlement of population. This must not exceed its scope which, at best, is limited by the complexity of rivers and scarcity of good soil.

" (5) Debushing is absolutely essential, and reduces fly to 10 per boy-day, and probably less. This can be attained by width of 10 yards each side on small streams, and not more than 25 yards each side in the case of main Nile tributaries.

" (6) It is the length of clearing which impedes *G. palpalis*, which does not readily undertake more than 1,000 yards of strip-clearing. The ideal road and crossing clearing is 2,000 yards by 10 yards each side. The minimum is 1,000 yards by 10 yards each side. Settlement clearings must project beyond the last homestead for not less than 500 yards, and, better, 1,000 yards.

" (7) Hand-catching can reduce fly probably to 10 per boy-day. The ill-effects of clearing on agricultural activities can be mitigated by a scheme of alternate strip clearings 1 mile in length, isolating bushy strips of equal length, in which catching and trapping can be done. Erosion is best prevented, and clearings maintained, by controlled grazing, which promotes rotation of grasses and establishes creeping varieties.

" (8) Debushing must always commence with the head-waters, and progress downwards. By doing so in the wrong direction there is great danger of fly being driven into a maze of tributaries, to spread infection.

" (9) Livestock act as a biological barrier. Instead of removing livestock from rivers for fear of attracting tsetse, they should be introduced deliberately.

" (10) Antrypol, as a 1-grm. dose, can protect clearing gangs for three months. It is also of value in preventing extension of epidemics."

W. Y.

NASH (T. A. M.). **The Probable Effect of Densification of Woodland upon the Distribution of Tsetse in Northern Nigeria.**—*West African Med. Jl.* 1938. Oct. Vol. 10. No. 1. pp. 10–13.

It has been found that in East Africa the exclusion of fire in certain vegetation communities results after a few years in a striking thickening of the vegetation, and that this densification is accompanied by a steady decrease in the *G. swynnertoni* population.

Judging from the East African reports it might naturally be assumed that a policy of densification of woodland would be an excellent anti-tsetse measure to employ in Nigeria, but most unfortunately this is not the case, as owing to the much severer climatic conditions experienced in Northern Nigeria, densification of woodland is precisely what tsetse need in order that they may extend their range.

Nash compares the habitats of *G. morsitans* in East and West Africa, and the reasons for the differences which occur in these two countries. He also discusses the habitats of *G. tachinoides* and *G. palpalis* in Northern Nigeria. As the result of his reflections he reaches the following conclusions :—

" 1. A large scale policy of densification of woodland by fire exclusion would be beneficial to tsetse in the Northern parts of Nigeria, enabling all the three common species to extend their range owing to the greater protection against adverse climate conditions afforded by thicker vegetation.

" 2. It would be most inadvisable to practise fire exclusion in *G. morsitans* belts.

" 3. Wherever possible forestry reserves in which fire exclusion is practised should be sited in uninhabited areas where *G. morsitans* does not occur.

" 4. In the vicinity of towns it is advisable that all streams within forestry reserves should be cleared and that no attempts be made to exclude fire. In this manner areas of woodland can be safely protected from exploitation, without unnatural densification and the consequent risk of becoming tsetse sanctuaries.

" 5. In the vicinity of towns all fuel plantations should be sited in areas lying *in between* streams ; if possible the edge of the plantation should not approach within quarter of a mile of a stream.

"6. Densification of vegetation could only succeed as an anti-tsetse measure in the southern parts of Nigeria where a cooler, moister climate makes tsetse prefer more open conditions, whilst the high rainfall tends to produce excessively dense vegetation."

Attention has been drawn by forestry officers and others to the very real danger to Nigeria of the deforestation which is taking place in many parts. The conservation of moisture by the soil is enormously reduced by the destruction of forest, and serious erosion is likely to take place when the natural covering of woodland is destroyed. It is the aim of the Nigerian Forestry Department that approximately 25 per cent. of each district should be under woodland.

Nash hopes that the present paper will help to clarify the issue between foresters and those engaged in sleeping sickness control by explaining the relationship which exists between tsetse, climate and vegetation, and further that it will be realized that there are no real obstacles between the policy of conservation of woodland and tsetse control, providing that due care is taken in the siting of forestry reserves and fuel plantations. *W. Y.*

Talice (R. V.) & Terra-Núñez (G.). Tercer caso uruguayo de enfermedad de Chagas. (Forma aguda.) [**Third Case of Acute Chagas' Disease in Uruguay.**]—*Arch. Uruguayos de Med., Cirug. y Especialidades.* 1938. Mar. Vol. 12. No. 3. pp. 241–248. [15 refs.]

Talice and his co-workers continue to record cases of Chagas' disease in Uruguay [see this *Bulletin*, 1938, Vol. 35, pp. 351, 352]. The patient in this instance was a man of 20 years. He woke up one morning feeling a hot itching sensation of the right eyebrow and three red spots were seen. The following day each of the three small lesions was covered by a scab and two days later there was oedema at first of the brow, but later spreading to involve the eyelids, cheek and adjacent part of the neck. By this time, the sixth day from the onset, he consulted a doctor. Palpable glands were felt in the neck, temperature was 38°C., and there was marked prostration with intense headache. *T. cruzi* was found in the blood. Improvement was very rapid and the patient was discharged from hospital four days after admission. He came from a rural part of the Department of Tacuarembó, and this is said to be the first case recorded from this part of the country. *H. H. S.*

Talice (R. V.), Rial (Benito) & de Medina (Federico). Forma aguda de enfermedad de Chagas (6° caso uruguayo) acompañada de hipertrofia de la glándula tiroides. [**A Case of Chagas' Disease accompanied by Enlargement of the Thyroid Gland.**]—*Arch. Uruguayos de Med., Cirug. y Especialidades.* 1938. May. Vol. 12. No. 5. pp. 497–510. With 7 figs. on 2 plates & 1 chart. [18 refs.]

This is the sixth case to be recorded by the authors in Uruguay; this time it was a boy of two years and the case also was one running an acute, but, on the whole, a mild course. The chief reason for calling attention to it is that during the illness the thyroid enlarged. The child's mother was very definite in her statement that there had been no such enlargement prior to the present illness, nor did either of the parents or any relatives suffer with a goitre. The enlargement

began to show itself at the end of the first week of illness and progressed for about a month, then became smaller but was still observable three months afterwards. The authors are convinced that there was an "acute congestive thyroiditis of trypanosomal origin." There were none of the usual signs of disturbance associated with ordinary goitre.

H. H. S.

TALICE (R. V.), REGULES (Uruguay) & ALAMBARRI (Alfredo). Los dos primeros casos de enfermedad de Chagas comprobados en la ciudad de Mercedes. [**Two Cases of Chagas' Disease, the First to be recorded in Mercedes.**]—*Arch. Uruguayos de Med., Cirug. y Especialidades.* 1938. Apr. Vol. 12. No. 4. pp. 438–447. With 3 figs. & 1 map. [17 refs.]

The cases here described, sisters aged seven and four years, were typical of the mild acute form of the disease, with dacryoadenitis, palpebral oedema and regional adenitis; no constitutional symptoms of any note, but the usual blood changes of anaemia, leucocytosis with relative mononucleosis. The only reason for recording these is that Mercedes is a place where cases have not been seen, or at all events recorded, hitherto. These are the seventh and eighth Uruguayan cases.

H. H. S.

TALICE (R. V.), DE MEDINA (Federico) & RIAL (Benito). Nueva observación de forma aguda de enfermedad de Chagas (9° caso uruguayo), con síntomas particulares. [**A Case of Chagas' Disease with Peculiar Symptoms.**]—Reprinted from *An. Facul. de Med.* Montevideo. 1938. Vol. 23. Nos. 4 & 5. 8 pp. With 2 figs. on 1 plate & 1 chart. [19 refs.]

This case of a patient in the Department of Paysandú is the ninth Uruguayan case recorded by the authors. The peculiarity in the symptoms referred to in the title consisted in the fact that although conjunctivitis and dacryocystitis were marked and acute there was no regional adenitis, preauricular or carotid, but later [? two days, but day of disease not stated] there was more general adenitis, especially inguinal, and slight enlargement of the spleen, leucocytes 11,500 per cmm., with relative lymphocytosis, 59·4 per cent. The authors incline to the belief that the condition was due to a "septicaemic phase of the trypanosomiasis." Symptoms on the whole were mild but were still present two months after the onset. There was no thyroid involvement.

H. H. S.

TALICE (R. V.). Dos nuevas observaciones de formas agudas de enfermedad de Chagas en el departamento de Paysandú (10° y 12° casos uruguayos). [**Fresh Observations of the Acute Form of Chagas' Disease in Paysandú.**]—Reprinted from *Arch. Uruguayos de Med., Cirug. y Especialidades.* 1938. June. Vol. 12. No. 6. pp. 645–651. With 3 figs. [20 refs.]

Two more cases of the "mild acute," form of this disease, one an adult of 26 years and the other a child of three years, occurring in the Paysandú Department of Uruguay. They were typical and call for no comment.

H. H. S.

Talice (R. V.), Alambarri (A.) & Regules (U.). Forma aguda de enfermedad de Chagas en un niño del Rincón de Cololó (Depto. de Soriano). (11° caso uruguayo.) [**Case of Chagas' Disease in a Child at Rincón Cololó.**]—Reprinted from *An. Facul. de Med.* Montevideo. 1938. Vol. 23. Nos. 9 & 10. 7 pp. With 1 plate. [24 refs.]

The patient was a boy of six years with typical symptoms. This is the eleventh case to be reported in Uruguay. The only reason for drawing attention to it here is that treatment consisted of " Sulfanil " Emar by mouth, two tablets daily of 0·3 gm. for fifteen days. In a " few days " the oedema, dacryoadenitis and the glandular enlargement subsided and no trypanosomes were found on examination of a thick drop of blood. When he was seen eleven weeks later the symptoms were still in abeyance, except that the pre-auricular and carotid glands on one side were palpable ; there was no enlargement of spleen or thyroid. The author is of the opinion that the " sulfanil " was highly beneficial, and he intends to test it in future cases in man and also experimentally [in animals]. *H. H. S.*

Talice (R. V.). Epidemiologia de la enfermedad de Chagas en el Uruguay. [**Epidemiology of Chagas' Disease in Uruguay.**]—*Arch. Uruguayos de Med., Cirug. y Especialidades.* 1938. July. Vol. 13. No. 1. pp. 45–60. With 2 maps. [21 refs.]

Talice (R. V.), Loustau (H. L.) & Sapriza (J. P.). Primera observación de forma aguda de enfermedad de Chagas en Carmelo (Dpto. de Colonia). [**The First Case of Acute Chagas' Disease observed in Carmelo.**]—Reprinted from *An. Facul. de Med.* Montevideo. 1938. Vol. 23. Nos. 9 & 10. 16 pp. With 8 figs. on 4 plates & 1 chart. [24 refs.]

Mazza (Salvador), Jörg (Miguel E.) & Feijóo (E. J. Canal). Investigaciones sobre la Enfermedad de Chagas. Primer caso cronico mortal de forma cardiaca de enfermedad de Chagas demostrado en Santiago del Estero. [**Study of a Chronic Case of Chagas' Disease ending Fatally.**]—*Universidad Buenos Aires : Misión de Estudios de Patología Regional Argentina Jujuy.* 1938. Publicación No. 38. 75 pp. With 61 figs. [15 refs.]

This long and detailed account cannot be satisfactorily abstracted. It concerns a girl who was six years old when first observed by one of the authors (E. J. C. F.) in September 1926, when she gave a history of fever and headache for the preceding 15 days, and had a slow, arhythmic cardiac action. She was seen at intervals till her death, 10 years 5 months later. The last fifty pages are devoted to a very minute description of the histopathological changes in the heart and liver, with abundant illustrations, photomicrographs, very well reproduced. The former showed chronic infiltrative myocarditis, with polymorphonuclear and eosinophil infiltration, and disorganization of striation in places. These are changes which have been found in other fatal cases of American trypanosomiasis and in animals subjected to experiment. There was also focal endocarditis with some oedema ; the liver showed nothing very characteristic. [Unfortunately, trypanosomes do not seem to have been looked for in the earlier

stages of the disease—at least, there is no record of their being found. The evidence that the condition was due to this infection is therefore indirect only.] *H. H. S.*

Boletin Sanitario. Buenos Aires. 1938. Sept. Vol. 2. No. 9. pp. 673–708. With 1 folding map. El bocio endemico en las provincias del Norte. [**The Prevalence of Endemic Goitre in the Northern Provinces (of the Argentine Republic).**]—a. Provincia de Tucumen [Lobo (M. M.)]. b. Provincia de Jujuy [Carrillo (D. F.)]. c. Provincia de la Rioja [Ocampo (E.)]. d. Provincia de Salta [Outes (J. D.)].

Four provinces have been investigated, namely Tucumán, Jujuy, La Rioja and Salta. In tables are given the numbers of persons examined in the various Departments of the Provinces together with the numbers with goitre and the degrees of enlargement. For these more intimate details the original must be consulted by those interested, but the general findings may be given.

In Tucumán, 12,456 were examined and 2,895 or 23·24 per cent. had goitre. Nearly three-fourths (72·3 per cent.) were small, 25 per cent. were of "medium" size and only 2·6 per cent. large. Incidence, 33·5 per cent., was greatest in the department of Chicligasta, mountainous in the west, where 169 out of 504 children examined had a goitre, one large, 44 medium and the rest small. The incidence in Jujuy cannot be stated, for the author merely gives the number detected at the various schools visited; the goitrous totalled 482, but this figure is valueless as the number examined is not mentioned. In La Rioja of 1,502 examined 491, or 32·6 per cent., had enlarged thyroids; 276 (56·2 per cent.) being between 5 and 10 years of age, and 215 (43·8) between 10 and 15 years. Lastly, in Salta province, among 3,500 pupils examined at various schools the proportion with goitre ranged between 15 and 45 per cent., the individual numbers examined at the different schools are not stated. [These figures are of importance in the interpretation placed upon them in districts where Chagas' disease is known to exist. Carlos Chagas, it will be remembered, finding these cases common in certain districts where American trypanosomiasis—*T. cruzi* infection—occurred, described a goitrous chronic form of the disease.] *H. H. S.*

Cardoso (F. A.). Sur le mécanisme de la transmission de la maladie de Chagas. [**The Mechanism of Transmission of Chagas' Disease.**] —*Ann. Parasit. Humaine et Comparée.* 1938. July 1. Vol. 16. No. 4. pp. 341–349. [20 refs.]

The paper begins with a summary of the work of other investigators on this problem. Up to the present two hypotheses have been advanced regarding the manner in which man becomes infected: according to Chagas, transmission takes place as the result of the bite of the insect, whilst, according to Brumpt, infection occurs by passage of the trypanosomes present in the faeces through the mucous membrane or through the abraded or intact skin.

As previous work exhibits various discrepancies, the author decided to re-investigate the subject. He used in his experiments infected *Triatoma infestans* and mice. In the first series of experiments freshly passed faeces of infected Triatoma containing about 8 metacyclic

trypanosomes per microscope field were placed on the intact mucous membrane (ocular 4 cases, vaginal 2 cases, buccal 2 cases, and rectal 2 cases). In all but two instances, one vaginal and one rectal, infection resulted.

In a second series of experiments, infected dejecta were placed on the intact abdominal skin of the mouse. All of 10 experiments were negative.

In the third series infected dejecta were placed on the lightly scarified skin; here, all of 10 experiments were positive.

In the fourth series of experiments an attempt was made to ascertain whether *Triatoma infestans* transmitted the infection by means of its bite. Great care was taken to make quite certain that the wound did not become infected with the faeces of the bug. In one of 10 cases a positive result was obtained. About a month later the experiment was repeated with the same bug, but in this case all 10 observations were negative.

The author discusses at some length the implication of these results, and particularly the explanation of the single infection produced by the bite. He thinks this may be due to regurgitation of trypanosomes from the intestine. [It seems to the reviewer that another possible explanation is that the mouth parts of the bug which infected may have been contaminated with metacyclic trypanosomes from its own faeces, or those of another bug, shortly before the experiment commenced.] *W. Y.*

Dias (Emmanuel) & Torrealba (J. F.). Infecção natural do *Eutriatoma maculata* pelo *Schizotrypanum cruzi*, no Brasil e na Venezuela. [**Natural Infestation of** *Eutriatoma maculata* **by** *Trypanosoma cruzi* **in Brazil and Venezuela.**]—*Mem. Inst. Oswaldo Cruz.* 1938. Vol. 33. No. 2. pp. 249–252. With 1 plate. [10 refs.]

E. maculata is known to have a wide distribution, being found in British Guiana, in Venezuela, in the States of Piauhy, Ceará, Rio Grande do Norte, Parahyba, Pernambuco and Bahia, but not till 1936 was it shown to be a natural vector of infection of Chagas' disease. The bug was known to exist, under the names *chupão* (lit. a red spot on the skin), *bicudo* (= sharp pointed, beaked), and *porocotó*, in dark dwellings, hen roosts, pig-styes and the burrows of armadillos and to attack man and animals. Some of these insects having been collected, they were dissected and in the duodenum and rectum crithidial and metacyclic forms of *T. cruzi* were seen. *H. H. S.*

Gasic (Gabriel). Indice de la infestación por el *Schizotripanum cruzi* de las vinchucas en algunas localidades de la provincia de Santiago. [**Infestation of Bugs by** *T. cruzi* **in Parts of Santiago Province, Chile.**]—*Rev. Chilena de Hig. y Med. Preventiva.* 1938. July–Sept. Vol. 1. No. 7–9. pp. 403–405.

Massa, in 1930, was the first to demonstrate infection of bugs by *T. cruzi* in Chile. The author has, in the latter half of 1937, travelled in the Province of Santiago examining the residents and domestic animals in houses and sheds infested with Triatoma. Blood in smears

and in thick drops was examined of 30 persons and the same number of animals and inoculations made into guineapigs and white mice, with entirely negative results. There is little doubt, however, in the author's mind that Chagas' disease does exist in the district because the infestation index among Triatoma is fairly high in some parts, and probably xenodiagnostic methods might reveal its presence.

Altogether 1,097 specimens of Triatoma were examined : 892 from Carem, 178 from Cajón del Maipo, 25 from Lepe and 2 from Melipilla. Of those from Carem 405 (45 per cent.) were infested, 292 of 564 adults (51 per cent.) and 113 of 324 larval and nymphal forms (26 per cent.). In Cajón del Maipo 63 were positive among 178 (35 per cent.), 50 out of 108 adults (46·3) and 13 of 70 in larval and nymph stages (18·5). Nine of the 25 from Lepe were positive. Of the two, one imago and one larva from Melipilla, neither was infested. *H. H. S.*

Talice (R. V.). Xenodiagnóstico positivo en una niña que un año antes presentó una forma aguda de enfermedad de Chagas. (18° caso uruguayo.) [**Xenodiagnosis in Chagas' Disease.**]—Reprinted from *An. Facul de Med.* Montevideo. 1938. Vol. 23. Nos. 9 & 10. 10 pp. [24 refs.]

A girl, seven years of age, was attacked in April 1937 with Chagas' disease in an acute form. When she was seen again a year afterwards there was slight oedema of the right eyelids (the side affected the year before had been the left). A xenodiagnostic test was made with positive results. [Nothing is said regarding blood examination for trypanosomes.] The author interprets this as a re-infection, since, according to the parents, the child had been in good health in the interval. *H. H. S.*

Dias (Emmanuel). Persistance de l'infection par le *Schizotrypanum cruzi* chez l'homme. Xénodiagnostics positifs dans deux cas, 16 ans après l'isolement. [**Persistence of *T. cruzi* Infection in Man. Xenodiagnosis in 2 Cases, 16 Years after Isolation.**]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 27. pp. 430–432.

In September 1922, two patients in the chronic stage of Chagas' disease were admitted to the Oswaldo Cruz Hospital at Rio de Janeiro. These patients were women, aged 32 and 26 years respectively, and came from the north of the State of Minas Geraes. Since 1922 they have frequently given positive Machado reactions.

In one of the patients (T.) the presence of *T. cruzi* was demonstrated 12 years after her removal from the endemic area ; in the other patient (A.), inoculation of blood into a guineapig gave a positive result. Since 1934 periodic attempts have been made to find the parasite in the blood. Inoculation of the blood of T. into a guineapig was positive on 25th May, 1934, after Villela had obtained two negative results. Patient A., whose blood was injected into a guineapig on the 24th March, 1923, gave negative results on the 1st November, 1933, and 25th May, 1934.

The xenodiagnostic test performed on both patients, with *Panstrongylus* (*triatoma*) *megistus* bred in the laboratory, gave positive results on 14th February, 1938. *W. Y.*

Mazza (Salvador). Instrucciones para el diagnóstico de laboratorio de enfermedad de Chagas. [**Instructions for Laboratory Diagnosis of Chagas' Disease.**]—*Instruccion No. 1 Misión de Estudios de Patología Regional Argentina.* 11 pp. With 7 figs.

This is a short paper, presumably for the information of the general practitioner, instructing him how to take a thick drop of blood for examination for trypanosomes, how to carry out the xenodiagnosis test, how to collect blood in a Bayer's venule for inoculation into animals and in another for the Machado-Guerreiro reaction, and how to obtain a fragment of lymphatic gland, and forward them to the laboratory. Illustrations depict details for the two first of these.

H. H. S.

Talice (R. V.). Primeras observaciones en el Uruguay de gatos espontáneamente infectados por el *Trypanosoma cruzi*. [**First Observation in Uruguay of Cats suffering from *T. cruzi* Infection.**]—*Arch. Uruguayos de Med., Cirug. Especialidades.* 1938. July. Vol. 13. No. 1. pp. 61–65. [21 refs.]

That cats may be naturally infected with *T. cruzi* was proved many years ago, by Chagas himself, in Minas Geraes. The author has found the same to occur in Uruguay. *H. H. S.*

Culbertson (James T.) & Kolodny (Maxwell H.). **Acquired Immunity in Rats against** *Trypanosoma cruzi*.—*Jl. Parasitology.* 1938. Feb. Vol. 24. No. 1. pp. 83–90.

The experiments described in this paper have shown that rats which have recovered from a *Trypanosoma cruzi* infection are completely immune to re-infection. Administration of serum of a recovered animal prophylactically will not prevent but will reduce the severity of an infection. When an infection has been established serum will reduce the number of trypanosomes in the blood, but these will increase again when the immune serum has been eliminated.

C. M. Wenyon.

LEPROSY.

Précis of Abstracts in this Section.

Germond (p. 234) emphasizes the benign character of the leprosy found in eastern Basutoland. The incidence is probably a little over 2 per 1,000, but is lower in the surveyed lowlands than in the surveyed highlands. Nutrition is good at present. Treatment is by intradermal chaulmoogra esters. Lowe (p. 235) regards the problem in Burma as serious, with incidence of from 1·6 to 5·6 per cent. of the population and with a high proportion of serious cases. Sardjito, Mochta and Tjitrohoepojo (p. 235) found 330 cases in a survey of Blora [Java]. They describe the measures taken for the discovery of the cases, the classification and treatment adopted. Koeslan (p. 236) shows that the incidence of leprosy varies directly with the degree of contact in various environments. Shionuma, Nagai and Maeda (p. 236) consider that leprosy tends to be more severe in colder than in warmer climates. Lowe (p. 236) considers that leprosy is more severe in Burmans than in Indians in Burma although the Burmans are better fed. He therefore postulates a racial factor in resistance.

de Moura (p. 237) gives the results of a study of 971 cases in Paraná. The mixed form was found in two-thirds of the patients. Pinkerton (p. 237) shows that in leprotic ulceration of the nose the bony structures escape. Nodular lesions of the tongue, soft palate and larynx occur. Chaulmoogra is not of much assistance, and in laryngeal lesions rest of the voice, as in tuberculosis, affords most relief. Rodriguez and Guinto (p. 238) describe the clinical features found in a re-survey of Cordova in the Philippines. Cochrane and Rajagopalan (p. 238) class very early cases as "precutaneous" when they have not developed definitely into either cutaneous or neural. The patients are usually under 14 and usually give a history of contact with a well-developed cutaneous case. Sloan (p. 238) describes leprosy affecting the prepuce. Baliña and Basombrio (p. 238) suggest a classification of leprosy, and Rabello and Rabello (p. 239) discuss their own.

Rabello (Jr.) (p. 239) discusses tuberculoid leprosy, which is a result of a blood distribution of bacilli to skin, nerves and glands. He also discusses the allergo-specific reactions in this condition. Parmakson (p. 239) considers that tuberculoid changes in nerve leprosy may be related to the presence of a certain degree of immunity. Twelve of 56 nerve cases in Esthonia showed these changes in varying degrees. Tisseuil (p. 240), from tests with skin grafts, believes that spread in tuberculoid patches is due to bacilli in the extending edge, and not to trophic or toxic effects.

Marchoux and Prudhomme (p. 240) describe a method of determining *in vitro*, without culture, whether leprosy bacilli are alive or dead. By this means they have arrived at conclusions as to the longevity of the bacilli under conditions of heat and desiccation. The bacillus of human leprosy is killed at 60°C. in 30 minutes. Prudhomme

(p. 240) by the same method found that the bacillus of rat leprosy is killed at 100°C. in 5 minutes, and by other agents in various periods.

Burnet (p. 240) succeeded in infecting a hamster with human leprosy bacilli, thus confirming the work of Adler. Marchoux and Chorine (p. 241) found it possible to infect a rat with five rat leprosy bacilli only. The development of the disease was slow.

Gomes (p. 241) reports that both filterable and non-filterable forms of rat leprosy bacilli occur in the nasal mucosa of rats 24 hours after infection. Cowdry and Ravold (p. 241) describe rosette shaped masses of bacilli in rat leprosy, unlike the faggot-like masses of the human bacilli. de Souza-Araujo (p. 241) found bacillaemia in experimental rat leprosy, with bacilli in the nasal mucus and the faeces. Possibly they appear in the nose through infection from the faeces. Sellards and Pinkerton (p. 242) report that the intracerebral injection of rat leprosy emulsions into monkeys, rabbits, white rats and mice produces progressive and often generalized lesions. White mice may be infected by injection into the spleen, liver or peritoneal cavity. In monkeys only low grade infections were produced by human leprosy material. The invasion of reticulo-endothelial cells is discussed.

Rotberg (p. 242) considers that the tuberculin reaction is not a group reaction and found that the percentage of lepers reacting to it was only slightly higher than that of non-lepers. Pereira (p. 242) working with the reaction of Lleras Acosta obtained results which differed considerably from those obtained by that author. Speight (p. 243) gives results of the serum formalin reaction in leprosy. Di Liddo (p. 243) tested the Witebsky, Klingstein and Kuhn reaction in lepers, contacts and controls but found the results to be of little diagnostic value.

Boenjamin (p. 244) describes a syndrome in which the diagnosis between leprosy and syringomyelia was made by the microscopical examination of a thickened nerve which showed acid-fast bacilli and the histological appearances of leprosy. He advocates this method.

Coelho (p. 244) describes six lepers with infantilism and concludes that leprosy acquired up to the age of puberty may bring about this condition.

Paras (p. 245) found that of the chemical fractions of leprotic nodules only the wax appeared to possess significant biological properties in producing skin reactions.

de Souza-Araujo (p. 245) obtains better results by combinations of many different treatments (which he details) than by the chaulmoogra treatment alone. Boenjamin (p. 245) reports satisfactory results of treatment with " 4828-a.J." The " leprosy reaction," if set up, may be treated with omnadin. The Central Leprosarium of Goa, and the treatments used there, are described (p. 246). Ross (p. 246) describes the biochemical changes (all temporary) which occur in the blood during treatment by pyretotherapy. Renal function is impaired, but not permanently. Basu (p. 246) reports on the value of animal protein in diet. Ryrie (p. 247) records success in the treatment of leprotic ulcers with dettol locally and intravenously, and Betz (p. 247) used cod liver oil locally, while Mehta (p. 247) injects a solution containing rivanol, glucose and other constituents at a distance from the ulcers, and a very similar solution intravenously. *C. W.*

i. GERMOND (R. C.). **A Leprosy Survey of the Eastern Border Districts of Basutoland showing the Results of Strict Segregation combined with Inspectorate Control, and the History of a Leper Family.**—*Internat. Jl. Leprosy.* Manila. 1938. July–Sept. Vol. 6. No. 3. pp. 303–314. With 3 figs. (2 maps).

ii. BASUTOLAND ANNUAL MEDICAL AND SANITARY REPORT 1937 [DYKE (H. W.), P.M.O.]. Appendix IV. pp. 42–46.—**Annual Report on the Leper Settlement at Botsabelo, Basutoland for the Year ended 31st December, 1937** [GERMOND (R. C.), M.O.].

iii. BASUTOLAND ANNUAL MEDICAL AND SANITARY REPORT 1937 [DYKE (H. W.), P.M.O.]. Appendix V. pp. 47–50.—**Report of a Leprosy Survey of Part of the Lowlands of Mafeteng District: January 19th to February 2nd, 1938** [GERMOND (R. C.), M.O.].

i. The author summarizes the results of this survey as follows :—

" 1. A leprosy survey of the eastern border districts of Basutoland is described.

" 2. The results are summarized : 13,187 individuals examined, 42 new cases found.

" 3. The extraordinary benignity of these cases is stressed : 90·5 per cent. are N1, while only 7·1 per cent. were C1 and 2·4 per cent. C1-N1.

" 4. More than 50 per cent. of the neural cases are clinically almost negligible, the rest are early and slight.

" 5. Most of the recurrences are extremely mild, and none of them severe or obviously infectious.

" 6. The position revealed by the survey is described as highly encouraging, if not unique.

" 7. There seemed to be no definite relationship between malnutrition, scabies, and syphilis on the one hand and leprosy on the other.

" 8. The most heavily infected families were well nourished, but very dirty.

" 9. The probable incidence of leprosy in Basutoland is estimated at a little over two per thousand of the population.

" 10. The present satisfactory position is attributed to the success of the Native Leprosy Inspectorate established in 1929.

" 11. The methods employed by these inspectors are described. The writer is of the opinion that the employment of natives is essential."

ii. The report on the Basutoland Leper Settlement at Botsabelo shows a decrease of 15 at the end of the year 1937 to 669, in spite of a number of admissions due to the surveys dealt with above. Among 88 admissions in 43, or 48·9 per cent., the disease was of not more than 12 months' duration ; in 17 per cent. it was 13–24 months, in 13·6 per cent. over two years and in the remainder unknown but mostly of long duration. This shows a high proportion of early cases. Between 1929 and 1936 the proportion of admissions within 12 months of the onset of the disease has risen from 36·8 to 52·2 per cent. The average age of development of symptoms was at the unusually high figure of 36·7 years, and has remained almost constant for seven years. The admissions of children up to 16 years remain from 15 to 16 per cent. Intradermal chaulmoogra esters constitute the routine treatment, and 71 patients were discharged during the year, their disease having been arrested. Contentment of the inmates has been successfully fostered by social amenities. [See this *Bulletin*, 1938, Vol. 35, p. 285, for previous Basutoland reports.]

iii. The results of this further survey are summarized thus by the author:—

Interpretation of Results shown in the Tables.

"1. The general nutrition of the population is an extremely unstable factor. It is at present excellent in the lowland area recently examined, whereas in the depression (1933 and 1934) and for a year or more afterwards it was one of the worst in Basutoland.

"2. The incidence of scabies is much lower in the lowlands than it was in the mountain area examined in 1936. The comparison is especially interesting with the well-nourished population of the Melikane Valley.

"3. The incidence of active external syphilis was found to be the same in the lowlands as in the mountain area.

"4. The incidence of leprosy is very much lower in the surveyed part of the lowlands than in the surveyed part of the Eastern highlands. This is strikingly illustrated by the following comparison:—

Melikane Valley (1936) incidence	...	...	8 per mille.
Qacha's Nek South ,,	...	...	4 ,, ,,
Quthing District ,,	...	...	2 ,, ,,
Mafeteng Lowlands (1938) ,,	...	...	½ ,, ,,

L. Rogers.

LOWE (John). **The Leprosy Problem in Burma.**—*Leprosy in India.* 1938. Oct. Vol. 10. No. 4. pp. 120–131.

This paper contains much information gleaned during a short tour in Burma. The census figures of advanced cases are quoted to show that the highest leprosy rates occur in a central belt from the Arrakan Hill tracts in the west to the Shan States in the East. Surveys indicate an incidence of about 1·6 per cent. of the population, rising in places to from 3 to 5 per cent. Examination of 586 village children gave the high rate of 5·6 per cent. The more serious lepromatous type formed 60 per cent. and neural cases 40 per cent.; this shows a larger proportion of serious cases than in India proper. In institutions the lepromatous type formed 70 per cent., and in out-patient clinics no less than 56·5 per cent. The problem in Burma is thus a very serious one. It was also observed that the villagers often isolate lepers, generally at a little distance from the village, and the encouragement of this system, and the founding of leper colonies at small cost, are recommended as prophylactic measures. *L. R.*

SARDJITO (M.), MOCHTAR (A.) & TJITROHOEPOJO (M. Soeparmo Honggopati). De voortgang van lepra "fieldwork" in het Regentschap Blora. [**Continuation of Leprosy Fieldwork in the Regency of Blora.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1938. July 26. Vol. 78. No. 30. pp. 1822–1830.

A survey of the Regency of Blora revealed 330 cases of clinical leprosy distributed in 129 of the total 296 villages. They were classified into 192 N (nerve), 63 C (cutaneous) and 75 CN (mixed) cases, of which 53 (16 per cent.) were children under 15 years. As there were 29 simple polyclinics distributed through the regency no leprous individual was more than 3 km. distant from one of these. Bedridden patients were visited at their own homes and therefore it could be said that systematic medical treatment was at the disposal of all. Treatment consisted of administration in low dosage of iodized ethyl chaulmoogra ethylate intramuscularly (this *Bulletin*, 1936, Vol. 33,

p. 611). A grading of the degree of leprosy infection was indicated by subdividing nerve cases into categories N_1, N_2, N_3 and the cutaneous cases similarly into C_1, C_2, C_3. In tracing leprosy cases inspection was directed especially to sufferers from any sort of skin disease and lepers were thus discovered who would not otherwise have been found. Although co-operation was obtained from all the authorities it was found that the village police brought up for inspection almost entirely advanced cases of leprosy. It was the institution of treatment itself which resulted in the voluntary presentation of the early cases and this fact gives cause for hope that such patients may at least be prevented from joining the ranks of the advanced lepers. It is still too early to pronounce on the attainment of definite cure and improvement. The mortality due to leprosy may be already said to be under check and control. *W. F. Harvey.*

Koeslan. Een bijdrage tot de epidemiologie der lepra ten platte lande in het Regentschap Lamongan, Java. [**Leprosy in the Regency of Lamongan, Java.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1938. July 26. Vol. 78. No. 30. pp. 1792–1806. With 5 figs. on 3 plates.

Leprosy is essentially a contact disease and it is to be expected therefore that intimacy and duration of contact will be powerful factors in the development of infection. The author goes rather elaborately into detail on the subject of the degree of contact between individuals which is to be ascribed to the family, the circle (fellow-workers, playmates, etc.), the village and to an indeterminate class. These he works out to be : family/circle, 48/1 ; circle/village, 5/1. The case incidence of leprosy for each category is proportionately :— family : circle : village : intermediate, 10·4 : 1·78 : 0·63 : 0·3.

W. F. Harvey.

Shionuma (Einosuke), Nagai (Kenji) & Maeda (Tei). **The Climate Theory in Leprosy.**—*Internat. Jl. Leprosy.* Manila. 1938. July–Sept. Vol. 6. No. 3. pp. 315–324. With 1 fig.

As the result of their inquiries in Japan the authors support the view that the warmer the climate the less severe the symptoms of leprosy, for they found the disease to be relatively mild in the warmer southern islands, with fewer cases of the lepromatous and more of the nerve type. The differences observed could not be explained as due to longer duration of the disease. They also found that alopecia leprosa, eye lesions and nerve symptoms are more severe in the colder areas.

L. R.

Lowe (John). **A Note on Racial Variations in Leprosy with Particular Reference to Indian and Burmese Races.**—*Indian Med. Gaz.* 1938. Oct. Vol. 73. No. 10. pp. 591–595. With 8 figs. on 2 plates. Also in *Leprosy in India.* 1938. Oct. Vol. 10. No. 4. pp. 132–139.

This paper is also the outcome of a three and a half weeks' survey tour in Burma dealt with above. In a Bengal survey neural cases formed 82 per cent. of the total cases, and the Philippine Islands showed a proportion of 50 per cent. In Burma the Rangoon Leper

Asylum, leprosy clinics and village data respectively showed in Burmans 75, 56 and 53 per cent. of lepromatous cases, and in Indians 39 and 31 per cent. in the two first series. The disease is thus more severe in the Burmans than in Indians in Burma, although many of the latter had contracted the disease in Burma. The evidence indicates that both races become infected in childhood, but age data indicates that leprosy develops earlier in the Burmans. Further, tuberculoid cases and nerve abscesses are rarer in Burma than in India. Yet the Burman is better fed than the Indian, although the former indulges in a stale fish product. The author therefore suggests that the Burmans have a hereditary and racial lack of resistance to leprosy infection. *L. R.*

DE MOURA (Aureliano M.). Estudo bio-estatistico de 971 casos de lepra no Hospital Colonia S. Roque. [**A Study of 971 Cases of Leprosy in the S. Roque Colonial Hospital, Paraná.**]—20 pp. English summary. 1938. Curitiba—Paraná : Empreza Grafica Paranaense.

This study is in the main statistical, at all events it deals with figures variously manipulated. Of the total 95·1 per cent. were white, 91·3 per cent. Brazilians ; the incidence in males was more than double that in females, 69·6 and 30·4 per cent. respectively. 73·3 per cent. were over 20 years of age. Four-fifths of the patients came from Paraná State and 10·5 per cent. from São Paulo. The mixed form was found in two-thirds of the patients, the maculo-anaesthetic in 18·9 and the nodular in 14·4 per cent. The initial lesions occurred on the face in 27·8 per cent., then in order forehead 11·2, hands 10·8, feet 8·8 and legs 8·3 per cent. These figures are given also in tables, and further subdivided into age and sex groups, and frequency of the different symptoms and their sites.

Of non-Brazilian patients, 64 in number, the ages ranged between 28 and 78 years, most occurring in the fifth decade. In them also the mixed form predominates, 63·1 per cent. The shortest time of residence in the country before the appearance of symptoms was 4 years ; one had been 68 years resident. *H. H. S.*

PINKERTON (Forrest J.). **Leprosy of the Upper Respiratory Tract. Discussion of Early and Moderately Advanced Cases.**—*Jl. Amer. Med. Assoc.* 1938. Oct. 15. Vol. 111. No. 16. pp. 1437–1442. With 14 figs.

This paper is based on seventeen years' experience at the Honolulu receiving hospital and the Molokai Settlement, and gives a well illustrated account of the leprous lesions of the mouth, nose and larynx. The author stresses the atrophy and destruction of the cartilages of the nose and septum, and the escape of the bony structures, in which leprosy differs from syphilis. This leads to falling in of the nasal tip. The sinuses appear to escape damage. Perforation of the septum is common, but he has not seen that of the hard palate occur in leprosy. Nodular lesions of the tongue, soft palate, epiglottis and other portions of the larynx are described and illustrated. He has not seen much good from chaulmoogra preparations in these advanced distressing cases, including spraying the larynx with them, but the use of bland oils in that way seems to be agreeable to the patient. Rest of the voice, as in tuberculosis, affords most relief. *L. R.*

Rodriguez (Jose N.) & Guinto (Ricardo S.). **A Field Study of Leprosy. II. Re-examination of Cases of Leprosy at Cordova, Cebu Province, Philippine Islands.**—*Internat. Jl. Leprosy.* Manila. 1938. July–Sept. Vol. 6. No. 3. pp. 285–302.

This paper deals only with the clinical features of a re-survey of the town of Cordova in the Philippines two years after the first inquiry in 1933. Several new cases were found although not all of the population of some 6,000 were examined. In 1933, 20 of 45 closed cases were classed as active, but only 13 were so two years later, and the improvement tended to be greatest among females. Of 15 positive cases on parole two had died and four relapsed. Of nine formerly suspicious cases three were still so regarded and three were not leprous. Six new open cases had developed in the two years, only one of whom was a house contact. *L. R.*

Cochrane (R. G.) & Rajagopalan (G.). **An Investigation Center for the Study of Childhood Leprosy.**—*Internat. Jl. Leprosy.* Manila. 1938. July–Sept. Vol. 6. No. 3. pp. 325–330. With 6 figs. on 2 plates.

The author once more stresses the importance of leprosy in childhood and describes the formation of a clinic at Saidpet, near Madras, for the study of the problem, following a preliminary survey revealing a high incidence. Among 1,871 pupils of schools in the area 65 were classed as probably leprotic, 40 as showing early and 3 late leprotic signs. He classes very early cases that have not yet developed definitely into either cutaneous or neural as " precutaneous," and they usually gave a history of contact with a well developed cutaneous case. Colour photographs are necessary to show clearly these lesions, and the patients are nearly always below 14 years old. They resemble Muir's " juvenile leprosy." *L. R.*

Sloan (Norman R.). **Circumcision in Leprosy.**—*Internat. Jl. Leprosy.* Manila. 1938. July–Sept. Vol. 6. No. 3. pp. 358–360.

This is a brief note on a case of cutaneous leprotic lesions of the prepuce of such severity as to cause retention of urine and necessitate circumcision. *L. R.*

Ryrie (Gordon A.). **An Infantile Macular Eruption.**—*Internat. Jl. Leprosy.* Manila. 1938. July–Sept. Vol. 6. No. 3. pp. 357–358.

Harrison (G. F.). **A Case of Leprosy in a British Soldier.**—*Jl. Roy. Army Med. Corps.* 1938. Sept. Vol. 71. No. 3. pp. 194–199. With 2 figs.

Baliña (Pedro L.) & Basombrio (G.). Classification des formes cliniques de lèpre. [**Clinical Classification of Leprosy.**]—*Rev. Brasileira de Leprologia.* São Paulo. 1938. Sept. Vol. 16. No. 3. pp. 225–228.

The authors discuss the Manila classification and suggest the following :—

I. Cutaneous or Lepromatous (C or L).
II. Maculo-anaesthetic (Ma).

III. Tuberculoid (Tde).
IV. Nervous (N): Purely nervous without maculo-anaesthetic lesions.
V. Combinations of the foregoing.

Definitions of the terms used are given. *L. R.*

RABELLO (Ed.) & RABELLO, Jr. Une classification clinico-epidemiologique des formes de la lèpre. [**Clinical-Epidemiological Classification of Leprosy.**]—*Rev. Brasileira de Leprologia.* São Paulo. 1938. Sept. Vol. 6. No. 3. pp. 229–243.

This paper discusses in a general way the principles on which the authors founded the classification they set out in a recent paper [this *Bulletin*, 1938, Vol. 35, p. 290]. *L. R.*

RABELLO, Jr. Etiologie générale et pathogénie de la lèpre tuberculoide. [**Aetiology and Pathogenesis of Tuberculoid Leprosy.**]—*Rev. Brasileira de Leprologia.* São Paulo. 1938. Sept. Vol. 6. No. 3. pp. 291–314.

This paper is a lengthy discussion on the incidence and nature of the tuberculoid type of leprosy. Under aetiology the author mentions the presence of lepra bacilli in small numbers, reactions to the antigens of the bacilli shown by positive Mitsuda tests, indicating good resistance, and the morphological reactions of the affected tissues. He shows that this type has now been recognized over nearly world-wide areas in varying proportions, including 10 per cent. of Brazil cases. It differs from lupus in not having a predilection for children and is relatively common in females, but he found it of nearly equal incidence in white and dark races. Familial and conjugal infections are frequent with this form, although it is itself scarcely at all contagious. The author discusses fully the types of tissue and antigenic reactions. The lesions result from the bacilli being distributed through the blood stream to the skin, nerves and lymph-gland tissues, which afford suitable conditions for their growth. He recognizes three forms of allergo-specific reactions; the first to antigens like vaccine lymph or tuberculin, the second with high haemo-sedimentation and negative Mitsuda test, and the third with low haemo-sedimentation and positive Mitsuda reaction. *L. R.*

PARMAKSON (P.). Ueber die tuberkuloiden Veränderungen bei Nervenlepra in Estland. [**Tuberculoid Changes in Nerve Leprosy in Esthonia.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1938. Sept. Vol. 42. No. 9. pp. 401–412. With 6 figs. [23 refs.]

The author reports an examination of 144 compulsorily isolated lepers in Esthonia including 88 cutaneous and 56 nerve cases. Among the latter 14 showed active skin lesions, and histological examination showed fully developed tuberculoid changes in two, moderate changes in four and slight ones in six cases, but no such appearances in two. The tuberculoid changes appeared to be peculiar to nerve cases, and the character of the lesions may possibly be related to the presence of a certain degree of immunity. *L. R.*

Tisseuil (J.). Différenciation par greffes dermo-épidermiques des différentes zones des taches de lèpre tuberculoide. [**Differentiation of the Zones of Tuberculoid Patches by Skin Grafts.**]—*Bull. Soc. Path. Exot.* 1938. Oct. 12. Vol. 31. No. 8. pp. 696–698.

The author records the results of grafting portions of healthy skin adjacent to either the active edge of a tuberculoid patch or to a central quiescent portion of a patch. In the former case the healthy skin graft is invaded from the edge of the tuberculoid patch, but no extension takes place from the centre of such a lesion. The author concludes that the spread is due to the presence of the leprosy virus in the extending edge, and consequently the increase of the lesion is not due to trophic or toxic effects. *L. R.*

Marchoux (E.) & Prudhomme (R.). Le bacille de Hansen meurt en moins de trente minutes à la température de 60° et par dessiccation. [**Hansen's Bacillus killed in Less than Thirty Minutes at 60°C. Heat and by Desiccation.**]—*Bull. Acad. Méd.* 1938. Oct. 4. 102nd Year. 3rd Ser. Vol. 120. No. 28. pp. 174–176.

Prudhomme (R. O.). Moyen de reconnaitre *in vitro* si le bacille de Stéfansky est mort ou vivant. [*In Vitro* **Recognition of Living Stefansky's Bacillus.**]—*Ann. Inst. Pasteur.* 1938. Nov. Vol. 61. No. 5. pp. 512–518.

In these papers a method is described for the recognition *in vitro*, without cultures, whether the human and the rat leprosy bacillus is living or dead. It is based on a reducing colour reaction produced by living, but not by dead organisms. O-cresol-indo-2-6-dichlorophenol is the reagent chiefly used in the experiments, by means of which the lethal action of heat and chemicals has been tested on the leprosy bacillus with the following results. A temperature of 60°C. kills Hansen's bacillus in 30 but not in 15 minutes. If the organism is desiccated over sulphuric acid, and then suspended in normal saline the reducing action occurs, but not after the organisms have been washed three times.

The second paper records work on similar lines on Stefansky's rat leprosy bacillus, which is killed by heating to 100°C. for five minutes, by the action of 1 in 100 formol in fifteen minutes and by ultra-violet rays in ten minutes. The emulsions employed contained very large numbers of bacilli. This method enables the vitality of the bacilli to be determined quickly without the use of prolonged animal experiments. *L. R.*

Burnet (Étienne). Inoculation positive de la lèpre humaine au hamster. [**Positive Inoculation of a Hamster with Human Leprosy.**]—*C. R. Acad. Sci.* 1938. Oct. 17. Vol. 207. No. 16. pp. 690–692.

This note records confirmation of the work of Adler [this *Bulletin*, 1938, Vol. 35, p. 293] in infecting a hamster with human leprosy bacilli in an emulsion. *L. R.*

MARCHOUX (E.) & CHORINE (V.). Cinq bacilles de Stéfansky suffisent pour infecter le rat blanc. [**Infection of White Rat with Five Stefansky Bacilli.**]—*Ann. Inst. Pasteur.* 1938. Sept. Vol. 61. No. 3. pp. 296–299.

It is known that very few tubercle bacilli may suffice to infect animals. The authors have carried out similar trials with the bacillus of rat leprosy, and have demonstrated that five may suffice to infect white rats with certainty, but with slower development of the disease than after larger numbers. *L. R.*

GOMES (J. M.). Pesquizas sobre a lepra murina eliminação de " virus." [**Elimination of the Virus of Rat Leprosy.**]—*Rev. Brasileira de Leprologia.* São Paulo. 1938. Sept. Vol. 6. No. 3. pp. 273–290. English summary.

The author concludes from experimental inoculations of rats with a filtrate of Stefansky's bacillus that within 24 hours the organisms commence to be eliminated through the nose both as acid-fast bacilli and in a filterable form. He noted a similar occurrence in a sporadic form in advanced cases of rat leprosy. The presence of filterable germs in the nasal mucous membrane was shown by the fact that emulsions of it filtered through a Seitz filter were infective by inoculation into rats with the appearance of acid-fast bacilli in the lymph glands. *L. R.*

COWDRY (E. V.) & RAVOLD (Amand). **Rosettes in Rat Leprosy.**—*Puerto Rico Jl. Public Health & Trop. Med.* 1938. Sept. Vol. 14. No. 1. pp. 3–15. With 10 figs. on 2 plates. [12 refs.] [Spanish version pp. 16–17.]

The authors describe and illustrate by microphotographs the intracellular formation of rosette shaped masses of lepra bacilli in rat leprosy, which differ from the faggot-like masses of Hansen's bacillus in globi in that the Stefansky bacilli are arranged radially. There may be a clear space around them, and separate rod-shaped bacilli may be seen in other parts of the same large multinucleated cell containing a rosette, which were stained by the Ziehl-Neelsen method. *L. R.*

DE SOUZA-ARAUJO (H. C.). A lepra dos ratos. [**Rat Leprosy.**]—*Mem. Inst. Oswaldo Cruz.* 1938. Vol. 33. No. 2. pp. 297–318. With 3 plates. [28 refs.]

The first half of this article reviews facts already known—the history, distribution, transmission experiments with Stefansky's bacillus, and the disease set up in rats. In the second part is an account of experiments carried out with three strains of the organism obtained, one from Professor FICKER in Germany, one from Professor MARCHOUX in Paris, and a third from Professor LAIDLAW in London.

Inoculation produced inflammatory granuloma. With the French strain infection was contracted by healthy rats in contact with diseased, but it was less virulent than the English strain. A bacillaemia is produced and the organisms are to be found in the nasal mucus and are eliminated in large numbers in the faeces. It may be that some of those with bacilli in the nasal mucus have been infected from the latter. Attempts to cultivate the organism from the three strains acquired were not successful. *H. H. S.*

i. Sellards (Andrew Watson) & Pinkerton (Henry). **The Behavior of Murine and Human Leprosy in Foreign Hosts.**—*Amer. Jl. Path.* 1938. July. Vol. 14. No. 4. pp. 421–434.

ii. Pinkerton (Henry) & Sellards (Andrew Watson). **Histological and Cytological Studies of Murine Leprosy.**—*Ibid.* pp. 435–442. With 8 coloured figs. on 1 double plate.

i. This is a comprehensive account of experimental animal inoculations of rat and human leprosy bacillus emulsions which is largely confirmatory of earlier work. In addition it is shown that intracerebral injections of murine leprosy produced progressive lesions, often accompanied by generalization through the internal organs, in monkeys, rabbits, white rats and mice, but not in guineapigs. White mice of mixed breeds were readily infected by injection into the spleen, liver or peritoneal cavity, but usually only abortive lesions resulted from subcutaneous injection except in some inbred strains. White mice have been infected by passage for four years.

In the case of human leprosy material in *rhesus* monkeys only low-grade infections were produced, as by other workers. Rats have been infected intracerebrally from the pia mater of a monkey and acid-fast bacilli found up to $3\frac{3}{4}$ years without progressive disease or active lesions developing.

ii. This paper is illustrated by good coloured plates to demonstrate the invasion of the mesenchymal cells of the reticulo-endothelial system by rat leprosy bacilli in the case of the liver, spleen, brain, sheath of a spinal nerve, testis, stomach, striated muscle, bone, lungs and to a slight extent the kidney. In animals surviving for long non-vacuolated cells filled with lepra bacilli develop in most organs. Non-pathogenic acid-fast bacilli, on the other hand, disappear within a few weeks after intracerebral injection into animals, and never produce metastatic lesions. *L. R.*

Rotberg (Abrahão). Estudos sobre as reções tuberculinicas na lepra. [**Tuberculin Tests in Leprosy.**]—*Rev. Brasileira de Leprologia.* São Paulo. 1938. Sept. Vol. 6. No. 3. pp. 245–272. [38 refs.] English summary.

The author has studied in 242 lepers the Mantoux reaction with a 1–10,000 dilution of Dorset's synthetic tuberculin, but found positive reactions to be only a little more frequent than in non-lepers. He therefore considers that the tuberculin test is only specific for tuberculosis and is not a group reaction. *L. R.*

Pereira (Paulo C. R.). A reação de Lleras Acosta na leprose. (Reação de fixação do complemento com antigeno metilico de bacilos acido-alcool-resistentes.) [**Reaction of Lleras Acosta (Complement Fixation with Methylic Antigen of Acid-Fast Bacilli.)**]—*Rev. Brasileira de Leprologia.* São Paulo. 1938. Sept. Vol. 6. No. 3. pp. 315–339. [15 refs.] English summary.

The author reports on 391 reactions carried out with the antigen of Lleras Acosta. He obtained positive reactions in 97·5 per cent. of 120 cutaneous cases of leprosy, in 81·48 per cent. of 32 bacteriologically negative lepers, in 4 per cent. of 100 children of lepers, in 18·42 per cent. of 76 patients with syphilis or other skin affections, and in 14 per cent. of 50 healthy persons. These data show large discrepancies

from those of Prof. Lleras Acosta. He is continuing his inquiry, so draws no conclusions at present. [See also this *Bulletin*, 1938, Vol. 35, p. 551 and p. 887.] *L. R.*

Speight (Arthur). **Observations on the Serum-Formalin Reaction in Leprosy.**—*Leprosy in India.* 1938. Oct. Vol. 10. No. 4. pp. 117–119.

The serum-formalin reaction, in general use for the diagnosis of kala azar, has been tried by the author in 100 cases of leprosy. Positive results were obtained in 55 per cent. against only 4 per cent. in 50 non-lepers. Cutaneous cases gave 63·5 per cent. and nerve cases 40·5 per cent. of plus reactions. An attempt to correlate the reactions with the sedimentation test was inconclusive. *L. R.*

di Liddo (Francesco). La reazione di Witebsky, Klingstein e Kuhn nella lebbra. [**The Witebsky, Klingstein and Kuhn Reaction in Leprosy.**]—*Riforma Med.* 1938. June 25. Vol. 54. No. 25. pp. 970–972.

This complement-fixation reaction with tuberculous antigen has been tested in lepers for some years [see this *Bulletin*, 1934, Vol. 31, p. 266; 1936, Vol. 33, pp. 305, 942] with discrepant results.

The author has carried out the test on 40 lepers, on 52 relatives and others cohabiting with lepers, and 71 controls. The subjects were divided into five groups as follows :—

Group I : comprising 34 cases of nodular leprosy, of whom 29 gave a positive, and 15 a negative reaction ; 5 with nervous leprosy of whom 3 were positive, 2 negative ; one suffered with the mixed form and he reacted positively.

Group II : Fifty-two relatives of, or living with lepers, but presenting no clinical signs of the disease. Eleven of these were positive, the rest negative.

Group III : Six lupus cases, 4 with lupus vulgaris, of whom 3 gave a positive, 1 a negative ; 2 with lupus erythematosus, both negative. They showed no evidence of tuberculosis.

Group IV : Forty suffering from venereal diseases : 1. One with ulcus molle—negative. 2. Four with gonorrhoea—3 negative, 1 positive. 3. Twenty-five syphilitics (W.R. positive)—7 positive, 16 negative, 2 doubtful. 4. Ten syphilitics (W.R. negative)—3 positive, 7 negative. Of the total 40, 11 were positive, 27 negative and 2 doubtful.

Group V : Twenty-five either free of disease or suffering from some cutaneous affection such as scabies, eczema, epithelioma. Of these, 20 were negative, 5 positive, and of the latter, 3 were healthy persons.

Seeing that so large a proportion of non-lepers give a positive and a considerable number of lepers a negative, the diagnostic value of the test is not great. *H. H. S.*

Soeparmo (M.). Een greep uit het leprawerk in het Regentschap Blora en het nut van de daarbij verrichte Takata-Ara-reactie. [**Leprosy Investigation in the Regency of Blora. The Takata-Ara Reaction.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1938. July 26. Vol. 78. No. 30. pp. 1817–1821.

Boenjamin (R.). Differentieele diagnose tusschen lepra en syringomyelie. [**Differential Diagnosis between Leprosy and Syringomyelia.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1938. July 26. Vol. 78. No. 30. pp. 1807–1816. With 4 figs. on 1 plate.

Nerve leprosy must occasionally give difficulty in diagnosis, especially when—as in this case—leprosy bacilli could not be detected in skin lesions or in nasal mucus. The nervous affection with which the case dealt with might have been confused was syringomyelia. A Chinese patient of about 36 years had been in Java for 16 years. No very definite history could be elicited that indicated the existence of leprosy in the family. The patient's symptoms are summarized as (1) muscular atrophy, (2) disturbances of sensation, (3) thickened nerves, and (4) ill defined anaesthetic maculae. These maculae, which are described as having been red, were treated by a so-called Chinese "sing seh" with actual cauterization, thus altering their appearance to smooth depressed scars of white or pink appearance. A summary is given of the facts which support either the diagnosis of syringomyelia or leprosy: (*a*) Anaesthetic areas with atrophy of muscles favouring syringomyelia; (*b*) Absence of definite maculae, a feature of syringomyelia, although at certain stages of improved leprosy, or old nerve leprosy, maculae do sometimes completely disappear; (*c*) The atrophy of the shoulder muscles, while arm and hand muscles remained unaffected, is uncommon in leprosy; (*d*) All the disturbances of sensation present could not be regarded as exhibiting definite segmental cord distribution as they should in syringomyelia; (*f*) Thickened nodular peripheral nerves are signs of leprosy; thickening of the great auricular nerve of the cervical plexus is almost pathognomonic; (*g*) Repeated examination of nasal mucus, blister fluid and thick drop for leprosy bacilli was always negative, but by splitting the perineurium of the great auricular nerve and picking off a portion of the nerve sheath with which to make a film, positive acid-fast bacilli were obtained; (*h*) Histological examination of a portion of this nerve showed features of leprosy involvement—atrophic nerve tissue, thickened epineurium, extensive central necrosis and peripheral granulation tissue; (*i*) A negative result by inoculation of animals.

There remained no doubt that the case was one of nerve leprosy and the recommendation of the author is, in such doubtful cases, to make microscopic examination of a thickened nerve (great auricular, peroneal or ulnar). *W. F. Harvey.*

Coelho (Joel Teixeira). Infantilismo na lepra. [**Infantilism in Leprosy.**]—*Rev. Brasileira Leprologia.* S. Paulo. 1938. June. Vol. 6. No. 2. pp. 135–149. With 6 figs. on 2 plates. [14 refs.]

The title of this article is a guarded one, probably intentionally so. Six cases of lepers, four aged sixteen years, one eighteen and one twenty-two, are detailed, all showing signs of infantilism. Tests were made to determine the action or want of action of normal endocrines, but no participation of these could be incriminated. In three of them there was a history of leprosy affecting the genitalia of one or other parent "which might have caused weakness or 'devitalization' of the germ-cell." More probably, it is suggested, the leprosy bacillus was the cause, acting on the system generally—on the liver, spleen,

haematopoietic organs and the glands of internal secretion. The author concludes, somewhat vaguely, that leprosy when acquired in infancy or at any time up to the beginning of puberty may bring about a condition of infantilism and that such cases may be classed as "leprotic infantilism." *H. H. S.*

PARAS (Ernesto M.). **Chemical Fractionation of Leprotic Nodules, I. Isolation of the Lipid Fractions.**—*Philippine Jl. Sci.* 1938. June. Vol. 66. No. 2. pp. 155–160. [10 refs.]

This chemical investigation at the Culion Settlement deals with fractionation of lepra bacilli obtained from nodules removed aseptically from patients on the lines of earlier work on the tubercle bacillus. The chemical processes are described, by means of which phosphatide, acetone-soluble fat and waxy constituents were isolated. Preliminary skin tests by injection of the different fractions show that only the wax appears to possess significant biological properties in producing reactions, which are less intense than those with the use of whole bacilli in the Mitsuda test. *L. R.*

DE SOUZA-ARAUJO (H. C.). Traitement éclectique de la lèpre. [**Treatments of Choice in Leprosy.**]—*Bruxelles-Méd.* 1938. Nov. 6. Vol. 19. No. 1. pp. 1–13. With 10 figs.

The author records that with twenty years experience of leprosy, and the advantages of having visited and seen the various forms of treatment in use in the most important research centres in the world, he came to the conclusion that the best results are obtainable by a combination of various forms of treatment. Among those he uses are surgical excision of isolated lepromata and of greatly thickened parts by plastic operations; the local application of the galvano-cautery, diathermic coagulation, and the application externally of trichlor-acetic acid; operations on thickened nerves, the removal of necrotic tissues of perforating ulcers and sympathectomy; intradermal, perineural and intra-glandular injections of chaulmoogra preparations. For nasal lesions he uses electro-fulguration, the application of 10 per cent. alcoholic solution of phenol and daily tampons of chaul-moogra oil or esters; in eye lesions the salts of gold. He gives illustrative cases with striking photographs before and after treatment, and concludes that with a careful selection of cases success can be obtained in 80 per cent. and although not all of them are permanently cured, he has seen cases remain well for from 5 to 7 years. By combined treatment he obtains in six months greater improvement than in 3 or 4 years with chaulmoogra treatment alone. *L. R.*

BOENJAMIN (R.). De lepratherapie in de kliniek in het bijzonder de omnadininjecties bij leprareactie. [**The Therapy of Leprosy in Clinical Practice and Omnadin Injections for Leprosy Reaction.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1938. May 31. Vol. 78. No. 22. pp. 1311–1322.

Two iodized ethyl ester preparations of chaulmoogra oil were tried out and the preference is given to the so-called Philippine preparation over that known as "4828-a.J." In adults during the first month 1 cc. was administered once weekly, during the second month 1½ cc. and during the 3rd month 2 cc. Then came an interval of a month followed by a repetition of the same dosage series. The results are

considered to be satisfactory. During treatment a " leprosy reaction " may be set up, which is of the nature of an exacerbation of the manifestations of leprosy and may be allergic. The treatment of this reaction was by 5 to 10 injections of omnadin in 2 cc. doses—daily in strong patients, and twice weekly in the feeble. By this treatment fever came down by lysis, appetite returned, pain in the joints subsided and lepromata became quiescent again. *W. F. Harvey.*

Arquivos da Escola Médico-Cirurgica de Nova Goa. Ser. B. 1937. No. 7. pp. 1602–1674. Leprosaria Central de Goa. [**The Central Leprosarium of Goa.**]

This is a report on the activities of the institute during 1935 and is mainly of local interest. The leprosarium is situated in the village of Macasana in the Salcete municipality ; it occupies an area of about 18 hectares and is divided into two parts ; in one are housed the patients, in the other the personnel engaged to attend them. During October and November there was an outbreak of influenza, but this did not appear to affect the course of the leprosy. Very brief notes are given of 103 patients treated in the institution during the year ; there were 9 deaths. Treatment was by chaulmoogra oil given intravenously in doses of 1 cc. twice a week, with an interval of a fortnight between series of four injections ; or by E.C.C.O. intramuscularly twice a week ; by moogrol iodide intradermically, by chaulmoogra by mouth and by inunction of chaulmoogra and coconut oil. Much of the report is taken up by laudatory remarks by visitors to the leprosarium and by a list of subscribers. *H. H. S.*

Ross (Hilary). **Pyretotherapy in Leprosy. Biochemical Changes resulting from Exposure to an Air-Conditioned Hypertherm.**—*Internat. Jl. Leprosy.* Manila. 1938. July–Sept. Vol. 6. No. 3. pp. 331–350. With 8 figs. [19 refs.]

Five patients in different stages of leprosy were given three courses of weekly treatments, during each of which the patients' rectal temperature was raised to between 105°–106°F. for from one to three hours, and in one patient for five hours. Elaborate biochemical tests were carried out on blood obtained from a vein at intervals, which furnished the following information. The acid-base equilibrium was greatly affected to the extent of producing moderate alkalotic tetany in one patient. The total proteins were much reduced from an originally high level. Nonprotein nitrogen, urea, blood chlorides and cholesterol were retained, accompanied by impairment of renal functions, albuminuria and casts ; but renal function tests showed no evidence of lasting damage to the kidneys. Haemoglobin and red blood cells decreased, but none of the changes were permanent. Contra-indications to the treatment are noted, but no information as to any results from it is recorded. The tests were made at the Carville Leper Settlement, U.S.A. *L. R.*

Basu (N. K.). **Further Studies on Leprosy and Vitamin B_2 (G) Deficiency.**—*Ztschr. f. Vitaminf.* Berne. 1938. Vol. 7. No. 3/4. pp. 297–298.

The author concludes from experiments on white mice that animal protein containing vitamin B_2 is superior as a diet to vegetable proteins. *L. R.*

Ryrie (Gordon A.). **On the Treatment of Leprotic Ulcers.**—*West African Med. Jl.* 1938. Oct. Vol. 10. No. 1. p. 41.

The author reports on the use of the proprietary antiseptic "dettol," both by injection of two or three ounces of a 30 per cent. aqueous solution into the affected tissues, and as a 10 per cent. solution for irrigation and dressing in leprotic ulceration and pustular inflammations. Injections cause a rise of temperature, but rapid improvement resulted in three bad cases. In eleven cases with pocketing or extensive ulceration very gratifying results were also obtained, although he does not advise its long use as a dressing as the parts tend to become sodden. Intravenous injections have also been used as a general treatment in 21 patients with definite improvement in three, but it is not clear that they are of value as a routine treatment. *L. R.*

Betz (Hans). Zur Behandlung lepröser Ulzera. [**Treatment of Leprous Ulcers.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1938. Oct. Vol. 42. No. 10. pp. 468–470.

In this note the author advises the use of applications of cod-liver oil containing vitamins, which may be combined with chaulmoogra oil or alepol. Similar applications may be made to the nasal lesions.

L. R.

Mehta (H.). **A Treatment of Perforating Ulcers in Leprosy.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1938. Sept. Vol. 2. No. 2. pp. 88–90.

The author recommends the injection of the following freshly prepared solution for the treatment of obstinate perforating ulcers of nerve leprosy. Rivanol gr. 1, glucose gr. 2, calcium lactate gr. 1, sodium thiosulphate gr. 2 and aqua cc. 10. The rivanol should be dissolved separately in warm distilled water and added to the others. For use, 3 cc. is injected in the sole of foot in ulcers of the big toe, and in the calf of the leg in those of the sole of the foot. In addition 1 to 2 cc. is injected in three places around the ulcers into the subcutaneous tissues. Intense pain, rigors and fever follow the injections, which may be repeated after a week's rest. Small ulcers may heal in three or four days and larger ones after two or three treatments. A very similar solution is also advised intravenously with the addition of trypaflavine and euflavine aa. gr. 1. Of 287 ulcers, 268 are reported to have healed under the treatment. *L. R.*

Chatterjee (Madhab Lal). **Treatment of Leprosy.**—*Calcutta Med. Jl.* 1938. Nov. Vol. 34. No. 5. pp. 413–426. [16 refs.]

Sitanala (J. B.). Het Noorweegsche systeem van leprabestrijding. [**The Norwegian Method of dealing with Leprosy.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1938. July 26. Vol. 78. No. 30. pp. 1831–1844. With 2 charts.

Villela (Gilberto G.). **The Biochemistry of Leprosy. A Review.**—*Internat. Jl. Leprosy.* Manila. 1938. Jan.–Mar. & Apr.–June. Vol. 6. Nos. 1 & 2. pp. 61–72; 223–232. [106 refs.]

HELMINTHIASIS.

Précis of Abstracts in this Section.

Tötterman (p. 248) found that alcoholic extract of tapeworm, if administered *per os* to patients suffering from anaemia due to Diphyllobothrium infection, caused a sharp fall in the number of red cells, probably through a mechanism of hypersensitivity. Sievers (p. 249) using the complement fixation reaction, found that antibodies were provoked in the serum of patients who had previously suffered from tapeworm anaemia, on the administration *per os* of either alcoholic extract of *D. latum* or of dried powdered worm. Controls were negative.

Mueller (p. 250) describes the progress of *Sparganum mansonoides* infection from the intestinal tract in various hosts. In *rhesus* monkeys gelatinous swellings in the lower part of the trunk occur due to the burrowing and disintegration of the spargana in the subcutaneous tissues. Previous injections of tapeworm substance prevent this, and the parasites are promptly encapsuled. Cornet (p. 250) advocates surgical treatment for palpebral, conjunctival and cutaneous sparganosis rather than intravenous novarsenobenzol.

Wang (p. 251) reports infection by *H. nana* in 0·33 per cent. of a large number of patients examined in Peiping. Bacigalupo and Aguirre Pequeno (p. 251) record a human patient infected with *H. diminuta* in Mexico.

Barnett (p. 251) gives figures of the incidence of hydatid infection in Australia and New Zealand. Marangos (p. 251) reports six cases of hydatid disease in one family. Coutelen (p. 252) reports further work on the germinal layer of hydatid cysts. Friedrich (p. 252) calls attention to the diagnosis of *Echinococcus alveolaris*; X-ray examination is useful. Leslie (p. 252) describes a patient with a hydatid cyst in each lung and Stevenson and Heggie (p. 252) two cases of hydatid disease of the lungs.

Hare (p. 252) records two patients with cysts in the brain. Both had epileptiform fits. de Sèze, Laplane and Fimbel (p. 253) discuss the symptoms and diagnosis of cysticercus of the optic chiasma. The colloidal benzoin reaction is described. Rogers and Tudhope (p. 253) record the operative cure of a patient with a hydatid cyst of the spinal canal. Castellani and Acanfora (p. 254) describe a patient dying with massive cysticercosis of the brain, heart and skin, and refer to luetic pseudocysticercosis.

Viljoen (p. 254) discusses the frequency of cysticercosis in cattle and pigs in South Africa and the commonest site of infection in the muscles. He considers that freezing at −10°C. for 14 days is enough to ensure the safety of lightly infected carcasses, however fat. He recommends treatment in man and close inspection of abattoirs for the eradication of the disease.

Roy (p. 255) records the twelfth human infection with *Bertiella studeri*. *C. W.*

Tötterman (Guido). Ueber die Pathogenese der Wurmanämie. [**The Pathogenesis of Worm [Diphyllobothrium] Anaemia.**]—*Acta Med. Scandinavica.* 1938. Vol. 96. No. 2–4. pp. 268–288. With 15 figs. [21 refs.]

The author's explanation of his findings is that the alcohol-soluble components of the worm may produce hypersensitiveness, a belief

favoured by the smallness of the doses used and by the failure of a second infection to cause anaemia, and that the mechanism of production of the antipernicious factor is weakened, so that this affection may supervene.

To nine patients, with a history of anaemia from Diphyllobothrium infection, there was given daily by mouth for 2 to 4 weeks 0·3 gram of dried worm or the corresponding dose of an alcoholic extract. In five of them the number of red cells fell sharply to as little as a million, but the haemoglobin did not fall, or did so but slightly (accordingly there was a rise in the colour index), but immediately on ceasing the administration of tapeworm substance, the blood condition began to improve, returning to normal in a few weeks ; when one of those reacting positively became infected with the tapeworm there followed a deterioration similar to that in this investigation ; there was no great alteration in white cells. The residue of the powder after extraction with alcohol had no effect on the blood. Of the other four patients two reacted to worm extract slightly, two not at all. There was no reaction to the worm preparation in three persons with a normal blood picture and in three with cryptogenetic pernicious anaemia. A serological test showed that those with a history of worm anaemia and those with the pernicious anaemia seemed to react more often than the others by the formation of an antibody. *Clayton Lane.*

SIEVERS (Olof). Serologische Prüfungen der Sera von *Bothriocephalus latus*-Trägern. [**Investigations on the Sera of Carriers of** *D. latum.*]—*Acta Med. Scandinavica.* 1938. Vol. 96. No. 2–4. pp. 289–303. With 4 diagrams. [17 refs.] [English summary *Acta Med. Scandinavica.* 1938. Supp. 89. pp. 151–152.]

" Previous investigations have revealed that the precipitation as well as the complement fixation reaction may give positive outcomes with sera from carriers of the broad tape worm. Examined control sera have also given partly positive results and we have, at least so far, been unable to obtain any reaction of diagnostic importance. The character of the positive outcomes has been generally considered as non-specific. Animal tests, however, show that exceedingly specific worm immune sera may be acquired by injection of worm substance (into rabbits).

" Dr. G. TÖTTERMAN has kindly placed at my disposal the cases related by him at this Congress and it seemed to me of interest from a general serological point of view to observe to what extent the blood of these patients, ' immunized ' with worm per os, contained worm antibodies. All the sera were tested with the complement fixation reaction, worm powder as well as alcohol extract of worm powder being used as antigen. Sera were obtained several times from each patient during the course of treatment.

" The results demonstrate that worm antibodies ensued in some cases, after administration per os of worm substance or alcohol extract of worm powder in persons who had suffered previously from bothriocephalus anemia. Positive outcomes were, with but one exception, always obtained with the alcohol extract and sometimes also simultaneously with worm powder as antigen. The Wasserman test was carried out in each examination and always with negative result. The antibodies proved by me in these serological investigations sometimes appeared after administration of worm powder and sometimes after alcohol extract had been given but, in the examinations so far made, never after administration of the residue left after alcohol extraction. The period of positivity was always very brief and there was no connection between the occurrence of antibodies and the symptoms indicating commencing anemia, at any rate not in this

material. Antibodies were not provable in sera from two control cases (non-bothrocephalus carriers), but they were present in some sera from persons with pernicious anemia.

"With a view to the present stage of these investigations one must be content with stating that worm antibodies may obviously ensue in the human organism on immunization per os and that patients who had suffered previously from bothriocephalus anemia and partly those also who had had pernicious anemia reacted more readily." *C. L.*

VON BONSDORFF (Bertel). Wird der antianämische Faktor in Leberpräparaten vom *Bothriocephalus latus* zerstört ? [**Is the Anti-Anaemia Factor in Liver Preparations destroyed by** *D. latum* ?]—*Acta Med. Scandinavica.* 1938. Supp. 89. pp. 153–156.

MUELLER (Justus F.). **Studies on** *Sparganum mansonoides* **and** *Sparganum proliferum.*—*Amer. Jl. Trop. Med.* 1938. May. Vol. 18. No. 3. pp. 303–328. With 16 figs. on 4 plates. [10 refs.]

A continuation of observations already reported [this *Bulletin*, 1938, Vol. 35, p. 667].

When *S. mansonoides* is swallowed by various hosts in which it does not become adult it penetrates the wall of the intestine, reaches muscle and continues to grow. Because it travels for some distance laterally under the peritoneum before piercing it, the intestinal contents do not escape into the peritoneal cavity. The adult taken from the cat and transplanted into tissues of the mouse lives and grows for about 3 weeks. The *rhesus* monkey will harbour plerocercoids to the number of 600 and will develop a condition of gelatinous swelling in the lower part of the trunk due to burrowing and disintegration of spargana in subcutaneous tissue. If, however, the monkeys have had injections of tapeworm substance this swelling does not occur, for the parasites are promptly encapsuled. In various hosts the infection by sparganum leads to a persistent eosinophilia of 15 to 35 per cent. while cats carrying the strobile show it, apparently temporarily, to about 8 per cent. A restudy of *S. proliferum* from Stiles's material shows no true scolex, a confused arrangement of muscle fibres, excretory canals and nerve cords, so it is concluded that the form is an aberrant type of the sparganum of some other species ; perhaps of *S. mansoni* or *S. mansonoides* since one or the other exists where *S. proliferum* has been reported. *C. L.*

CORNET (Emmanuel). Note sur une nouvelle méthode de traitement de la sparganose oculaire. [**A New Method of Treatment of Ocular Sparganosis.**]—*Rev. Méd. Française d'Extrême-Orient.* 1938. Feb. Vol. 16. No. 2. pp. 151–153. [17 refs.]

Cornet is not enthusiastic about the treatment of ocular sparganosis by intravenous injections of novarsenobenzol as described by KELLER [this *Bulletin*, 1938, Vol. 35, p. 223].

As contrasted with surgical intervention, intravenous treatment is tedious, as Keller reports, needing 5 to 9 months in certain cases. Surgical treatment if the sparganum is palpebral, sub-conjunctival or cutaneous is rapid and sure, whereas in retrobulbar infection local injection of alcohol or attraction of the parasite to superficial sites by

applied heat may be used. Acute inflammation means bacterial infection, and for certain diagnosis a cut with a knife discloses a tunnelled fibrous mass. *C. L.*

WANG (Lo-shan). **Human Infection of *Hymenolepis nana* in North China. An Analysis of 171 Cases.**—*Chinese Med. Jl.* 1938. Aug. Vol. 54. No. 2. pp. 141–150. [13 refs.]

Of 51,856 patients examined, usually by three fresh faecal smears, at the Peiping Union Medical College Hospital between 1926 and 1937 infection with *H. nana* was found in 171 (0·33 per cent.), records being complete in 164.

Of these last, this infection was detected as the sole one in 52, and as accompanied by other parasites in 112, these other parasites being protozoa only in 36, helminths only in 42, and both sorts in 34. The ages of those infected by *H. nana* ranged from 80 days to 70 years, it being commonest among those of 25 years. It was not possible to prove that symptoms shown by these patients were due to this infection. Eosinophilia was as high as 5 per cent. in those who had other parasites as well, but was usually below this. *C. L.*

BACIGALUPO (J.) & AGUIRRE PEQUENO (E.). Un nouveau cas d'*Hymenolepis diminuta* chez l'homme, au Mexique. [***H. diminuta* in Man in Mexico : a Fresh Case.**]—*Bull. Soc. Path. Exot.* 1938. June 8. Vol. 31. No. 6. pp. 502–504.

A second case of this infection from Mexico is reported in man. One to two cysticerci were discovered in 0·88 per cent. of female *Xenopsylla cheopis* examined. *C. L.*

BARNETT (Louis). **Hydatid Disease : Incidence in New Zealand.**—*New Zealand Med. Jl.* 1938. Aug. Vol. 37. No. 200. pp. 188–192.

The incidence of hydatid infection in Australia and New Zealand together with deaths (in brackets) during 1937 were as follows : Totals 1,226 (143), liver 770 (102), lungs 236 (15), muscles and fascia 57 (2), kidney 32 (6), bones 32 (4), brain 12 (3). While the totals for Australia and New Zealand were respectively 611 (65) and 615 (78) ; the corresponding figures for liver were 425 (50) and 345 (52) and for lungs 94 (5) and 142 (10). *C. L.*

MARANGOS (G.). Beitrag zum familiären Auftreten der Echinokokkenkrankheit. [**A Familial Outbreak of Hydatid Infection.**]—*Muench. Med. Woch.* 1938. June 3. Vol. 85. No. 22. pp. 830–833. With 3 figs.

Father, mother and four children, fugitives from Asia Minor, were treated in the Red Cross Hospital, Athens, for hydatid disease. After operation on the liver four died. In one of the two survivors, X-rays showed extensive cysts in the lungs. *C. L.*

Coutelen (F.). Sur la structure de la membrane proligère des hydatides échinococciques. [**The Structure of the Germinal Layer of Hydatid Cysts.**]—*C. R. Soc. Biol.* 1938. Vol. 128. No. 23. pp. 946–948.

A preliminary report of further work (see also this *Bulletin*, 1932, Vol. 29, p. 53) on the structure of the germinal layer of hydatid cysts. A detailed illustrated report will be published. *C. L.*

Friedrich (H.). Die Diagnose des Echinococcus alveolaris (infiltrierend wachsender Echinokokkus) ; keine extrem seltene, sondern fast immer verkannte Erkrankung. [**The Diagnosis of** *Echinococcus alveolaris* **(that growing by Infiltration) ; not a Rare Illness but One nearly always missed.**]—*Med. Klin.* 1938. Sept. 16. Vol. 34. No. 37. pp. 1220–1222.

Friedrich has seen in 4½ years ten histologically confirmed cases and holds that every doctor must always have in mind the possibility of *Echinococcus alveolaris* in a patient who shows a painful wasting malignant swelling that does not behave as a true malignant tumour. As an aid to diagnosis, of 7 cases which have been X-rayed, there have been in 5 fine points of calcification which allow of a true diagnosis.

C. L.

Leslie (Charles J.). **Pulmonary Echinococcosis.**—*Amer. Jl. Dis. Children.* 1938. June. Vol. 55. No. 6. pp. 1267–1272. With 4 figs.

An American born boy of seven had a hydatid cyst in each lung. One was punctured with escape of typical fluid without hooklets ; an intradermal test was then positive for hydatid, with eosinophilia from 4 to 21 per cent. ; puncture was followed by much toxicity, high fever, meningismus and pneumothorax, for which decompression had to be done. The other cyst seemed to be increasing ; the patient died of a perforated gangrenous appendix and autopsy was refused.

C. L.

Stevenson (Douglas Stuart) & Heggie (James Ferguson). **Echinococcus Disease : Hydatid Cysts in Lung and in Liver.**—*Glasgow Med. Jl.* 1938. July. Vol. 12. No. 1. pp. 25–28. With 6 figs. on 3 plates.

Two cases were treated in Glasgow. One had two pulmonary cysts, of which one was punctured with recovery of brood capsules, and the second burst into the air passages with expectoration of hydatid cyst wall and pus. In the second a cyst was discovered in the quadrate lobe of the liver after death from decompensated cardio-renal disease.

C. L.

Hare (Clarence C.). *Cysticercus cellulosae* **of the Brain. Report of Two Autopsies.**—*Jl. Amer. Med. Assoc.* 1938. Aug. 6. Vol. 111. No. 6. pp. 510–515. With 6 figs.

In one of these cases there had been operations on two cysts in the brain ; autopsy revealed a number more widely disseminated and degenerating. The illness started with epileptiform fits and ended in

mental changes. In the second, epileptiform fits had occurred for 20 years. In both there was hydrocephalus and reticulo-endothelial activity in the walls of cyst cavities. *C. L.*

DE SÈZE (S.), LAPLANE (L.) & FIMBEL (M.). Cysticercose opto-chiasmatique. [**Cysticercosis of the Optic Chiasma.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1938. July 11. 54th Year. 3rd Ser. No. 24. pp. 1202–1206.

Excess of lymphocytes, precipitation of colloidal benzoin in the first 10 or 12 tubes and local eosinophilia in the cerebrospinal fluid occurring in the absence of a Wassermann reaction give a certain diagnosis of cerebrospinal cysticercosis.

The history is given of a woman with temporal hemianopsia of the right eye with headache, loss of the power to distinguish scents, with a constant bad smell in her nose, pain in the sacrolumbar region with the right patellar reflex nearly absent and the left one active. Cysticercus cysts in the lower part of the spinal canal and about the optic chiasma were diagnosed. Those about the optic chiasma were exposed and removed with some improvement in vision before she was lost sight of. *C. L.*

[The authors lay stress on the colloidal benzoin reaction and its use in the diagnosis of cerebrospinal cysticercosis. The reagents are made up as follows: (1) One gram of freshly powdered Sumatra gum benzoin is dissolved in 10 cc. absolute alcohol. This is well shaken and left to stand for 48 hours. It is then decanted and 0·3 cc. of the clear fluid slowly added to 20 cc. of *twice* distilled water at 35°C. A homogeneous suspension is thus obtained which must be freshly prepared for use. (2) A 0·01 per cent. solution of chemically pure sodium chloride, in water twice distilled through a glass condenser.

For each cerebrospinal fluid to be examined a series of tubes is put up. Into the first is placed 0·25 cc., and into each of the remainder 1 cc. of the salt solution. Into the first is measured 0·75 cc. of the cerebrospinal fluid, into the second 1 cc. After mixing, 1 cc. is removed from the second and placed in the third tube, and so on, except that the last tube does not receive any C.S.F., acting as a saline control. To each tube is now added 1 cc. of the gum benzoin suspension, and mixed. Readings should be made after 12 hours at laboratory temperature. Three degrees of precipitation are recognized: 0 where no change takes place, 2 where complete precipitation with clear supernatant fluid occurs, and 1 intermediate. (Braxton HICKS & PEARCE, *Brit. Med. Jl.*, 1924, Feb. 16, p. 268.)

GUILLAIN, PÉRON & THÉVENARD (*C. R. Soc. Biol.*, 1926, Vol. 95, p. 455) give readings in cerebrospinal cysticercosis of 1222122222100000 and 1222222222210000. In conjunction with excess of albumin, positive Pandy reaction, lymphocytes numbering from about 76 to 312 per cmm. and negative Wassermann reaction, a colloidal benzoin reaction positive in the first 10 to 12 tubes indicates the diagnosis of cerebrospinal cysticercosis—*Ed.*]

ROGERS (J. S. Y.) & TUDHOPE (G. R.). **Hydatid Cyst of the Spinal Canal successfully treated by Operation.**—*Arch. Dis. in Childhood.* 1938. Sept. Vol. 13. No. 75. pp. 269–274. With 3 figs. [16 refs.]

". . . . the case serves as a reminder that the site of election of hydatid cysts in the spinal canal, extradurally and on the posterior surface of the

cord, facilitates operative removal, and that the results of operation are frequently most favourable."

The child of 9 had paresis and paraesthesia of the lower limbs and lipiodol showed spinal blockage at the level of the first lumbar vertebra. A cyst, easily shelled out, measured $2 \times \frac{3}{4}$ inch and when opened displayed hydatid hooklets. She completely recovered movements and lipiodol passed to the lower end of the spinal canal. *C. L.*

CASTELLANI (Aldo) & ACANFORA (G.) **Brief Notes on Cysticercosis and Luetic Pseudocysticercosis.**—*Jl. Trop. Med. & Hyg.* 1938. July 1. Vol. 41. No. 13. pp. 213–217. With 8 figs.

A general consideration of these two conditions with illustrative cases.

The ten-year-old daughter of a Calabrian pig breeder ate pork, often underdone, daily. Fever, headache, and exophthalmos were in her history; there was eosinophilia of 30 per cent., trichuris eggs in the stool, and a negative Wassermann reaction and many small nodules over the skin, mostly as large as a pea, but varying from the size of a rice grain to that of a cherry. She became epileptic, cyanotic and developed tachycardia, dying in her third epileptic attack. The cysts were cysticerci and photographs of the heart and brain show massive infections.

The luetic condition is illustrated by the man already reported [this *Bulletin*, 1938, Vol. 35, p. 225] with the additional information that some nodules reappeared in March 1938 and disappeared under neoarsphenamine bismuth treatment. The Wassermann reaction at the time of retreatment is not noted. *C. L.*

VILJOEN (Noel Francois). **Cysticercosis in Swine and Bovines, with Special Reference to South African Conditions.**—*Onderstepoort Jl. Vet. Sci. & Animal Industry.* 1937. Oct. Vol. 9. No. 2. pp. 337–570. With 4 charts, 2 maps & 17 figs. [14 pages of refs.]

This exhaustive treatise (its digestion would have been quickened by a table of contents) takes the history of pork measles back to B.C. 424 when ARISTOPHANES mentioned the custom of examining pigs' tongues for glandular tumours, through LEUCKART's infection of a calf by feeding it on *Taenia saginata*, to a survey of cysticercoses in swine and cattle in most countries of the world. The information regarding the last is got not only from the literature but also from replies to questions which were addressed by the author to many authorities in many places and which constitute a valuable record. As to Union abattoirs, the discovered percentage of *C. cellulosae* varied from 0·5 at Aliwal North to 25·07 at Senekal; and that of *C. bovis* from 0·08 at Heilbron to 7·29 at Port Elizabeth. The commonest seat of infection in 30 pig carcasses minutely dissected was the muscles above the elbow (triceps, etc.), and the only instances in which measles were not found there were two animals in which less than 10 measles in all were found. The means of spread in the Union will be understood from the following two examples. There is the instance of a farmer and his household who used the rear of a quince hedge close to the homestead because compared with a stinking, fly infested privy it was far cleaner, thanks to the pigs which can be trained to come at a whistle. Then there was

that of three farmers, amongst the foremost in the Union, with pigs scrupulously styed. When measles were found in their pigs their faith in the life-history of the worm as told them was shaken, till on Viljoen's advice they watched their native staff; two of them then reported enthusiastically that each had seen one of these men easing himself in the sty and in one case the culprit had a tapeworm. Enquiries as to the farmers' attitude to the culprits were not pressed. These illustrations justify the advice that insurance schemes for farmers which include indemnification for measles found at abattoirs in carcasses of their stock should be abolished, since they encourage carelessness.

C. bovis in 25 carcasses of oxen was found in largest numbers and in all animals in the hind limbs and about the shoulder and elbow; it was least common in the diaphragm; in lightly infected beasts the cysts were most frequently found in the masticatory muscles.

As judged by the evagination of the scolex of cysticerci swallowed in a bag or celluloid case which was then recovered from the faeces, *C. cellulosae* which had been first frozen for 5 days was not viable. For safety it is felt that a not too fat pig carcass frozen at −10°C. for 7 days is safe, and that from the public health point of view a lightly infected carcass however fat, kept at this temperature for 14 days was so. For *C. bovis* 6 days continuous freezing of the carcass is held to be enough. Here as elsewhere in the paper the literature is summarized (the extent of the references shows how fully) in addition to the author's own experience in animals and that of his correspondents in animals and man. His recommendations for sorely needed eradication are necessarily divided between the elimination of the strobile in man including free treatment and rewards for heads [but would not some of the class of person here described make themselves rich as self-breeders of tapeworms at 2/6 a scolex?] and close inspection of abattoirs. *C. L.*

Roy (Sudhir Chandra). *Bertiella studeri*, **a Natural Tape-Worm Parasite of Monkeys, in a Hindu Child.**—*Indian Med. Gaz.* 1938. June. Vol. 73. No. 6. p. 346.

The twelfth case reported from man.

The segments were passed by a Brahmin boy of eight living in Bengal. They were identified by P. A. Maplestone. *C. L.*

MALARIA.

Précis of Abstracts in this Section.

Russell (p. 256) discusses the quinine supplies in India.

Richard (p. 257) found in dogs that quinine may produce disturbance of co-ordination through a reflex labyrinthine mechanism. Gorbitz (p. 257) lays stress on the toxicity of quinine and prefers atebrin as a schizonticide. Plasmoquine has little toxicity in the small doses now recognized as sufficient.

Gentzkow and Callender (p. 257) detail the treatments given to the Panama Canal Department of the United States Army. These cannot be further summarized. Quinine, in the large and long continued doses given, is rather more effective than atebrin in preventing relapses in *vivax* infections, and markedly so in *falciparum*. Plasmoquine has a pronounced effect in reducing the relapse rate. Siegenbeek van Heukelom and Overbeek (p. 258) show that atebrin is more effective than quinine in tertian malaria, but point out that toxic effects occur after atebrin injections. Kekhcher (p. 259) has found acriquine to be efficient and well tolerated. Dozortseva (p. 259) as a result of experiments on rabbits found that the combination of plasmocide and acriquine in the proportion of 1 to 3 is less toxic than either drug given alone. MacMahon (p. 259) finds that a treatment of quinine and plasmoquine compound followed by atebrin and plasmoquine compound (given simultaneously) gives better results than any other form of treatment in Trinidad, where the infections are chiefly subtertian.

Faget, Palmer and Sherwood (p. 260) report unfavourably on the sulphanilamide treatment of two patients with *vivax*, one with *falciparum* and one with *malariae* infection. Voorhoeve (p. 260) found good results in the treatment of malarial splenomegaly by intramuscular injection of iodinequinine, a mixture of quinine, adrenalin, iodine and glycerol. Romeo (p. 261) treated three patients successfully by the Ascoli method.

Hill and Goodwin (p. 261) found that atebrin grains 1½ three times weekly gave good results in the prophylaxis of malaria in Georgia where mosquito control was impossible. Melik-Adamian (p. 262) considers that prophylactic treatment with acriquine should be reserved for those who have suffered from malaria the previous year. He records his results. Fattovich and Lenti (p. 262) report that after a course of treatment with manganese iodomercurate, 17 of 21 non-immune patients were refractory to *vivax* infection when a period of 45 days or more was allowed to elapse between the treatment and the bites by infected mosquitoes. Kalmus and Kostić (p. 263) in Jugoslavia found that 26 per cent. of 196 patients treated with quinine sulphate alone and 6·8 per cent. of 162 treated with plasmoquine showed a first relapse. Subsequent relapses occurred in 6·6 per cent. in the quinine, and 0·62 per cent. in the plasmoquine series. *C. W.*

Russell (A. J. H.). La distribution de la quinine dans l'Inde. [**Distribution of Quinine in India.**]—*Bull. Office Internat. d'Hyg. Publique.* 1938. July. Vol. 30. No. 7. pp. 1566–1568.

The question of quinine supplies in India was treated more fully by the same author in the December 1937 issue of the Records of the Malaria Survey of India (see this *Bulletin*, 1938, Vol. 35, p. 418).

The amount of quinine distributed by public health and medical agencies in 1935 in British India amounted to 0·06 gm. per head of population, and of cinchona febrifuge to 0·43 gm. per head. [The latter figure is erroneously printed as 0·06 gm.]. *Norman White.*

RICHARD (Abel). Etude du mécanisme d'action de la quinine sur le système nerveux. [**Mechanism of the Action of Quinine on the Nervous System.**]—*C. R. Soc. Biol.* 1938. Vol. 127. No. 13. pp. 1232–1234.

Experiments on dogs, which are described, lead to the conclusions that quinine is not toxic to the nerve centres, has no direct action on the psychomotor centres and that the disturbance of co-ordination that quinine may produce is attributable to a reflex labyrinthine mechanism. *N. W.*

GORBITZ (Guillermo). Tolerancia de los medicamentos antipalúdicos. [**Toleration of Anti-Malaria Drugs.**]—*Crónica Méd.* Lima. 1938. Jan. Vol. 55. No. 895. pp. 22–31.

This paper, which starts with a list of anti-malaria remedies, is chiefly concerned with the pharmacology of quinine, atebrin and plasmoquine, with special attention to the toxic symptoms attributable to each. The toxicity of quinine for protoplasm is made much of. A very complete study of the literature concerning unfortunate sequelae to the administration of quinine has been made and the impression conveyed by a perusal of the four pages devoted to this topic is that quinine is a dangerous drug. The author reaches the conclusion that on all counts atebrin, as a schizonticide, is much to be preferred to quinine ; it is much better tolerated by the organism than is quinine and produces fewer and less important subjective symptoms. Plasmoquine, the only elective gametocide, has but little toxicity, given alone, in the small doses now recognized as sufficient. *N. W.*

GENTZKOW (Cleon J.) & CALLENDER (George R.). **Malaria in the Panama Canal Department, United States Army. II. Results of Treatment with Quinine, Atabrine and Plasmochin.**—*Amer. Jl. Hyg.* 1938. Sept. Vol. 28. No. 2. pp. 174–189.

For the past few years the Panama Canal Department of the United States Army has had an average troop strength of about 13,000, with a malaria rate of approximately 40 per thousand per annum. The results of treatment of cases occurring in a population under continued careful observation and control cannot lack interest. Cases were treated in the different station hospitals or at the Gorgas or Colon Hospital. The treatment given in these different institutions was not uniform : in fact, many types of treatment have been used. In general it may be said that the doses given are largely in excess of those usually given at the present time. Before the use of atebrin the more or less standardized quinine treatment consisted of 1 gram of quinine in solution three times a day while in hospital, followed, after discharge, by 1 gm. a day for 90 days. Atebrin, when first used, was given in doses of 0·1 gm. three times a day for five days ; the period was afterwards prolonged to seven and then to nine days, or even

longer if parasites persisted. Early in 1935 the atebrin treatment was standardized to a certain extent ; 0·2 gm. three times a day for the first day ; 0·1 gm. three times a day for the subsequent six days. In some hospitals this treatment was reinforced with plasmoquine, 0·01 gm. three times a day on the third, fourth or fifth days, in the treatment of all types of malaria. At some hospitals the plasmoquine in these doses was given after the atebrin treatment. At the Colon Hospital, atebrin 0·6 gm. was given, in a single dose, daily for four days followed by plasmoquine 0·01 gm. three times a day for three days. This dosage was " quite satisfactory " but the dose of atebrin has recently been reduced to 0·4 gm. As a follow-up treatment 0·2 gm. atebrin is given daily for seven days, a month after the previous attack.

The number of cases on which this report is based is 1,696. Of 967 *vivax* cases 22·9 per cent. relapsed ; of 683 *falciparum* infections 5 per cent. relapsed ; of 46 *malariae* cases 2·2 per cent. relapsed. Most relapses, 83 per cent. of the *vivax* and 97 per cent. of the *falciparum* cases, occurred within six months of the preceding attack.

The following conclusions are drawn. Atebrin alone has failed to prevent relapses to a greater extent than any other of the treatments tried. Quinine, in the large and long continued doses mentioned above, is somewhat more effective in preventing relapse in *vivax* infections than is atebrin and markedly so in *falciparum* infections. Plasmoquine given concurrently with, or following, atebrin has a pronounced effect upon the relapse rate in all types of malaria ; this effect was specially noteworthy in the *vivax* cases. *N. W.*

Siegenbeek van Heukelom (A.) & Overbeek (J. G.). Behandeling van de acute malaria-aanval met atebrine pro injectione. Tweede mededeeling. [**Treatment of Acute Malaria with Atebrin Injections.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1938. July 12. Vol. 78. No. 28. pp. 1658–1683. With 3 figs. [47 refs.] English summary.

Of 875 cases of malaria treated in hospital in Batavia 518 were *falciparum* infections and 111 *falciparum* combined with *vivax*. The case mortality rate was high, 7·5 per cent. in subtertian, 2·5 in tertian, and 2·7 per cent. in combined subtertian and tertian. Intramuscular atebrin injections were given to 634 of these patients. Two injections of 300 mgm. were insufficient to prevent subtertian relapses. Atebrin by mouth, 300 mgm. a day for three consecutive days, starting five days after the last injection, was accordingly given to 410 patients, with the result that the relapse rate was only 4·4 per cent. as compared with 16·2 per cent. among those patients treated by atebrin injections alone. These are minimum figures as it was not possible to follow up all patients discharged from hospital. In uncomplicated subtertian fever treated by atebrin injections the temperature fell to normal within two days in 89 per cent., as compared with 75 per cent. in a comparable series of cases submitted to a short course of quinine by mouth. Well-nourished Europeans and Japanese could generally tolerate three or four injections of atebrin if these were given at intervals of not less than 24 hours. In patients with jaundice or with damaged livers atebrin should be given with caution. A badly-nourished native infected with *Pl. malariae* developed jaundice the day following an atebrin injection and died five days later with acute

atrophy of the liver. No case of cerebral excitation following atebrin treatment was observed. Intoxication occurs with greater frequency after the intramuscular injection of atebrin than after the oral administration of the drug ; in tertian fevers the oral administration is to be preferred. Atebrin is more effective than quinine in the treatment of tertian malaria in so far as the prevention of relapse is concerned. In severe subtertian cases that are kept under observation the advantages of atebrin injections outweigh the attendant danger of drug intoxication. Atebrin injections are not suitable for mass treatment.

N. W.

Kekhcher (O. M.). Epreuve de l'acriquine comme moyen antipaludique sur le terrain. [**Value of Acriquine as an Antimalarial Remedy in the Field.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 2. [In Russian pp. 155–177. French summary p. 177.]

The author has found acriquine to be well adapted to use in the field. In the treatment of tertian fever with acriquine schizonts and gametocytes alike disappear from the blood in from three to four days. The percentage of early relapses after the treatment was 25·9. Health is rapidly re-established under the treatment and the drug is well tolerated. Symptoms of intolerance are few and insignificant. Yellow discolouration of the skin is more frequent among women and children than among men. Three courses of treatment prolong the intervals between relapses by not less than two months. *N. W.*

Dozortseva (P. M.). Sur la toxicologie et la pharmacologie du composé de la plasmocide et de l'acriquine. [**Toxicology and Pharmacology of Plasmocide and Acriquine Compound.**]—*Med. Parasit. & Parasitic Dis.* 1938. Vol. 7. No. 2. [In Russian pp. 197–206. With 21 figs. French summary p. 207.]

The author considers the results hitherto obtained in this inquiry as provisional only, but the following conclusions are justified. The combination of plasmocide and acriquine, in the proportion of 1 : 3, diminishes one of the most serious symptoms ascribable to the administration of plasmocide alone, namely its spasmodic action on the vascular system of the isolated ear and of the kidney of the rabbit. It also lessens the toxic action that both plasmocide and acriquine exercise singly on the cardiac activity of both cold and warm blooded animals. Respiration does not appear to be depressed : occasionally it is stimulated. Blood pressure is temporarily lowered but there is no weakening of the heart's action. Peristalsis of the isolated rabbit's intestine is weakened but the rhythm of isolated contractions is not slowed. Comparative experiments show that rabbits tolerate better the intravenous injection of the two drugs combined than the injection of acriquine alone. These intravenous experiments indicate the possibility that the proportion of acriquine in the combination might be increased. *N. W.*

MacMahon (Ryan). **Treatment of Malaria.** [Correspondence.]—*—Brit. Med. Jl.* 1938. Sept. 24. p. 681.

In an article on the treatment of Malaria the British Medical Journal reproduced a statement of the Malaria Commission of the League of

Nations to the effect that the simultaneous administration of atebrin and plasmoquine appears to aggravate the toxicity of each and is not to be advised [see this *Bulletin*, 1939, Vol. 36, p. 11]. Dr. MacMahon, writing from Trinidad, takes exception to this statement. The simultaneous administration of these drugs has given him incomparably better results than has any other form of treatment. He states that the drugs should only be given on a full stomach and that the acute malaria patient is seldom a hearty eater. He accordingly treats acute cases (mostly subtertian infections) with large doses of quinine and small doses of plasmoquine compound. When the symptoms have disappeared, and the patient is feeding well, atebrin-plasmoquine compound treatment is begun, one tablet of each three times a day after food. [One tablet of atebrin contains 0·1 gm. of the drug, one of plasmoquine compound contains 0·01 gm. plasmoquine and 0·125 gm. quinine.] With this treatment less than ten per cent. of his patients have shown toxic symptoms and more than 75 per cent. have had no recurrence of malaria. *N. W.*

Faget (G. H.), Palmer (M. R.) & Sherwood (R. O.). **Unsuccessful Treatment of Malaria with Sulfonamide Compounds.**—*Public Health Rep.* 1938. Aug. 5. Vol. 53. No. 31. pp. 1364–1366.

Favourable reports on the treatment of malaria with prontosil induced the authors to treat three cases of malaria, two *vivax* and one *falciparum* infection, with sulphanilamide, orally. One case of *vivax* infection was apparently cured at the end of 12 days' treatment but there was a relapse 12 days later. The other two patients received no apparent benefit: the subsequent administration of quinine was promptly effective. A fourth patient undergoing quartan malaria therapy for cerebrospinal syphilis was treated with prontosil, 10 cc. of a 2·5 per cent. solution, intramuscularly, every 12 hours. There was no demonstrable effect on fever or parasites, except that there appeared to be an unduly large number of gametocytes. All the patients were hospitalized throughout their illness. The authors conclude that neither sulphanilamide nor prontosil possesses any practical chemotherapeutic value in malaria and that they cannot be regarded as satisfactory or safe substitutes for quinine. *N. W.*

Chopra (R. N.). Present Position of Anti-Malarial Drug Therapy in India.—*Indian Med. Gaz.* 1938. July. Vol. 73. No. 7. pp. 418–423.

Voorhoeve (H. C.). De interne therapie der malaria-splenomegalieën. [**Treatment of Malarial Splenomegaly.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1938. Oct. 25. Vol. 78. No. 43. pp. 2681–2687. English summary.

"In 45 patients with malaria splenomegalies varying in size from number 3 to 6½ (according to Schüffner) a treatment was applied consisting of intramuscular injections twice a day of 2 cc. iodinequinine (that is a mixture of quinine, adrenaline, iodine and glycerol); 2 cc. iodinequinine corresponds with ½ gram of bihydrochloras chinini. Children got a smaller dose agreeing with their age. Only in one patient no improvement appeared; in all others a reduction of the spleen, sometimes even a considerable one was seen. Some patients showed an after effect; by the control, held some months later, a still smaller spleen was found than at the time of finishing the last injection.

" So the internal treatment of the malaria splenomegalies appears to be of value; it must first be applied before having recourse to surgical treatments."

ROMEO (Vincenzo). Contributo alla cura dell'infezione malarica col metodo " Maurizio Ascoli." [**Treatment of Malaria by Ascoli's Method.**]—*Policlinico.* Sez. Prat. 1938. Aug. 22. Vol. 45. No. 34. pp. 1562–1566. [32 refs.]

This paper contains a general discussion of Ascoli's method of treatment and of the pharmacological properties of adrenalin. The successful treatment of three cases of malaria is described. *N. W.*

LIVIERATO (S.). Sul trattamento della splenomegalia malarica col metodo di Maurizio Ascoli. [**The Treatment of Malarial Splenomegaly by the Method of Ascoli.**]—*Policlinico.* Sez. Prat. 1938. May 9. Vol. 45. No. 19. pp. 899–904. With 5 figs.

RAVARA (Andrea). Sull'azione meccanica di costruzione dell' adrenalina e sull'azione del chinino somministrato prima della iniezione dell' adrenalina. [**The Mechanical Action of Adrenalin and the Action of Quinine administered before Adrenalin.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1938. June. Vol. 19. No. 6. pp. 367–369.

HILL (Roy A.) & GOODWIN (Melvin H.), Jr. **Two Years Observation on the Use of Atabrine as a Prophylactic Agent in Malaria.**—*Amer. Jl. Trop. Med.* 1938. July. Vol. 18. No. 4. pp. 339–345.

A population of 1,646 inhabiting a wild game preserve in a highly malarious part of Georgia was the subject of these observations. Ordinary mosquito control measures could not be taken as every effort was made to increase the amount of water available for the game. The object of the inquiry was to find a suitable method of drug prophylaxis. During the first year three groups of approximately equal size were subjected to experiment. Members of the first group received atebrin, 1½ grains, three times a week; those of the second group received 10 grains of quinine daily; the third group was the control. All persons in all three groups who harboured parasites were treated and rendered parasite free before the administration of the prophylactics was begun. Clinical cases of malaria during this first year amounted to 1·8 per cent. of the atebrin group, 5·6 per cent. of the quinine group, and 31·7 per cent. of the control group. During the second year quinine was not used; clinical cases amounted to 0·3 per cent. of the atebrin group and 5·3 per cent. of the control group. Initial blood examination revealed a parasite index of 16·9 per cent.; at the end of the second year it was only 0·3 per cent. in the area in which atebrin was given during the second season. At the close of each season when final blood smears were collected, plasmoquine, 1/6 grain three times a day for seven days, was given. *Pl. falciparum* was found in 92 per cent. of the positive blood smears. Co-operation of the persons taking quinine was difficult to obtain and occasionally it was necessary to stop its administration because of idiosyncrasies and toxic reactions. No toxic reactions to atebrin were observed. *N. W.*

MELIK-ADAMIAN (S. S.). Essai de l'emploi de l'acriquine en masse pour le traitement des enfants paludéens. [**Acriquine in the Mass Treatment of Malarious Children.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 2. [In Russian pp. 178–191. [55 refs.] French summary p. 191.]

School-children to the number of 2,031 who had suffered from malaria the previous year were treated with acriquine in April 1935. During the subsequent 13 months the percentage of relapses was only 11·5. Ordinarily there is a spring wave of relapses in the malaria curve. Of the relapses that did occur 60 per cent. were experienced in May and June 1935; they became less and less frequent as the year advanced and in the following spring, 1936, their number was negligible, 0·6 per cent. in April and 1·3 per cent. in May. No prophylactic administration of acriquine was given to them in 1936. The treatment of acute cases of malaria among children of pre-school age with acriquine was followed by a relapse rate of only 26 to 30 per cent. during a prolonged period of observation.

The author considers that prophylactic treatment with acriquine ought to be reserved for those who have suffered from malaria the previous year. Periodic examination of the blood, especially during the epidemic season, with a view to identifying parasite carriers among those who suffered the previous year, and the systematic treatment of such carriers, are important anti-malaria measures; they were of great assistance in improving the health of the community that was under observation. *N. W.*

FATTOVICH (Giovanni) & LENTI (Pietro.) Ricerche sperimentali sull' azione profilattica dello jodomercurato di manganese verso l'infezione malarica umana inoculata da zanzara. [**Experimental Investigation of the Prophylactic Value of Manganese Iodomercurate in Malaria.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1938. Mar. Vol. 19. No. 3. pp. 129–160. With 7 graphs. [51 refs.]

The observations recorded were made in three widely separated psychiatry institutions in Italy and had as their object the determination of the value of mercury in combination with manganese, in the form of an iodate, in association with spleen extract, in the prevention of malaria. The patients were selected with due regard to past history, only those who were unlikely to have any acquired immunity to malaria being used. These were submitted to a month's treatment, in one institution in January, in the second in April and in the third in August. The drug was given in pill form, each pill containing manganese iodomercurate 0·011 gm. and spleen extract 0·05 gm. The commencing dose was one pill every second day; this was gradually increased to eight pills a day at the end of treatment. The drug was given in the morning on an empty stomach. There were no signs of drug intolerance and the general health of most patients was improved by the treatment; increased haemoglobin, increased red cells and an increase in the leucocyte count were commonly noted.

At varying intervals after the completion of this medication the patients were bitten by anophelines infected with *P. vivax.* Controls

demonstrated the adequate infectivity of the batches of anophelines used. If an interval of not less than 50 days had elapsed since the end of treatment a very well marked resistance to infection was noted ; still better results are obtained if the interval be increased to two months or more. This refractoriness was shown by 5 of 7 patients at Imola inoculated 45 days after treatment and by all of three inoculated four months after treatment. In Venice 9 of 11 inoculated two months after treatment resisted infection.

The authors conclude that this mercury-manganese preparation in association with spleen extract, unlike quinine and synthetic malaria remedies, has a real prophylactic action in malaria, possibly brought about by an exaltation of the powers of resistance that the reticulo-endothelial system normally possesses. [See also this *Bulletin*, 1938, Vol. 35, p. 31.] *N. W.*

KALMUS (H.) & KOSTIĆ (D. Y.). Ueber die Herabsetzung der Zahl der Tropicarezidive durch Plasmochin. [**Reduction of the Number of Relapses in Malignant Tertian Malaria by Plasmoquine.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1938. Nov. Vol. 42. No. 11. pp. 501–502.

The authors made a study of the records of the malaria dispensary of the hygienic institute in Skoplje, Jugoslavia. Case records for the year 1937, numbering 8,700, were carefully investigated, children under 1 year of age and cases of pregnancy being excluded. Plasmoquine was almost exclusively administered to patients in whose blood *Plasmodium falciparum* was found, analogous cases of the same infection treated with quinine sulphate alone were used for comparison. Quinine sulphate was given in doses of 0·5 gm. twice daily till 5 to 6 gm. had been administered in all. The plasmoquine was administered in two methods : (1) As quinoplasmoquine, namely, 15 tablets, one tablet thrice daily for 5 days, each tablet containing 0·01 gm. plasmoquine and 0·3 quinine. (2) As plasmoquine co., after a four-day period of quinine administration (0·5 gm. twice daily), one tablet containing 0·01 gm. plasmoquine and 0·125 gm. quinine sulphate was given thrice daily for a further period of five days. Since in Macedonia the risk of infection with malignant tertian malaria does not exist from the middle of October to the beginning of May, the cases occurring during this period were regarded as relapses which, after the completion of the above treatment, gave a positive blood result.

The action of plasmoquine in reducing the number of relapses is seen in the following table :—

Mode of treatment	Quinine sulph.	Quin.+plasmo-quine co.	Quino-plasmoquine
Total cases	196	57	105
1st relapse	51	4	7
2nd relapse	8	0	1
3rd relapse	4	0	0
4th relapse	0	0	0
5th relapse	1	0	0

These cases were extracted from the 8,700 case records. Expressed in percentages, 26·0 per cent. had a first relapse after quinine treatment only and 6·8 per cent. after plasmoquine treatment. Subsequent relapses occurred in 6·6 per cent. in the quinine and 0·62 per cent. in the plasmoquine series. The authors consider that the results are fairly free from fallacies. *E. D. W. Greig.*

REVIEWS AND NOTICES.

WORTHINGTON (E. B.) [M.A., Ph.D., (Cantab), Director of the Freshwater Biological Association of the British Empire formerly Demonstrator in Zoology at Cambridge University]. **Science in Africa. A Review of Scientific Research relating to Tropical and Southern Africa.** Issued by the Committee of the African Research Survey under the Auspices of the Royal Institute of International Affairs.—pp. xiii+746. With 5 maps (1 coloured folding) & 8 plates. 1938. London: New York: Toronto: Humphrey Milford, Oxford University Press. [10*s.* 6*d.*].

This is a great achievement. The author has collected an enormous mass of detailed information, put it together skilfully and presented it in a readable and entertaining form. The constituent chapters might have been written each by a specialist in the subject dealt with, under one editor in chief, but thereby the book would lose much of its charm and interest and become a collection of special reports or monographs, whereas we have here the broad view of one who has studied so far as it is possible for one individual the many sides of the comprehensive subject of *Science in Africa*, and the author visualizes the inter-relation of the various problems which present themselves in a way which separate specialist accounts could never do.

Mere enumeration of some of the chapters will show the extent and depth of observation required. For one man to write on the geology, the meteorology, forestry (including under this forest reserves, destruction of forest and its results), zoology, game and game-preservation, entomology (with accounts of disease vectors—tsetses, mosquitoes, ticks and fleas—insect pests and termites), agriculture, health problems and the chief diseases of man and stock, and anthropology, and to do all this intelligently, without padding, betokens powers of observation and width of outlook possessed by few.

The chapters which most concern readers of this *Bulletin* are the three devoted to *Health and Medicine* on general lines, to *Human Diseases* in more detail, and to *Health and Population*; these together make up more than one-fifth of the entire book. In the first of these the author mentions the present organizations, international and special as regards individual Governments, Colonies and Protectorates, the arrangements made for dealing with disease and the prevention if it, child welfare work and social assistance generally, and, of the utmost importance, the medical education of Africans to undertake routine work under supervision, for it is impracticable, if not impossible, to provide adequate medical attendance for millions of natives by practitioners with European qualifications. The training of nurses and midwives is another matter of the very highest importance, and is hampered by the difficulty of finding native women of sufficient education to profit by the teaching.

In the chapter on *Human Diseases*, the author groups these under four main categories:—

1. Those due primarily to conditions of life and likely to disappear when the latter improve; this group includes malaria and blackwater fever, sleeping sickness and jungle yellow fever. 2. Those due to insanitary conditions such as bad housing, water supply, conservancy and so on; such diseases as plague, relapsing fever, typhus, tuberculosis, leprosy, helminthic infestations, enteric infections and dysentery, pneumonia and yaws. It would appear to the reviewer that this is a

very arbitrary grouping; several of the latter—tuberculosis, plague, typhus, enteric, for example—being as much due to bad social conditions as malaria or even more so. 3. Diseases whose spread is largely due to ignorance, such as the venereal infections. 4. Those due to or aetiologically associated with malnutrition. Readers will see that such a grouping would leave out some diseases and on the other hand several diseases might with equal right be placed under one or more of the groups.

This chapter gives also a survey of research work on malaria, yellow fever, trypanosomiasis and plague and of the work carried out to control leprosy.

The chapter on *Health and Population* points out the importance and value of vital statistics and demography and the regrettable but unavoidable lack of accurate data. In this chapter the question of food and nutrition is discussed and the closely connected question of the physiology and development of the African. The chapter ends with remarks on the health of Europeans and the vexed question of deterioration of it under tropical conditions and the means for preventing it.

The work is embellished by a few well chosen and well reproduced maps and illustrations and a full bibliography of 65 pages arranged according to the chapters to which the works named particularly apply, so that anyone interested in any particular aspect of the subject knows where to seek for further information. Finally, the author has given full acknowledgment to all who have helped him in providing information for this work, which has the exceptional merit of being interesting to dip into and to have by one for reference. It is a mine of information. *H. H. S.*

Macchiavello (Atilio) [D.M., Dr. P.H. (Harvard) etc.]. **Investigaciones sobre la bacteriología e inmunología del tifo exantemático.** [Studies on the Bacteriology and Immunology of Typhus.]—pp. xx+222. With over 100 illustrations. [Bibliography.] 1938. Santiago: Soc. Imp. y Lito. Universo, Ahumada 32.

The studies described and collected in this volume were carried out during a period of three years. The descriptions are so detailed, the methods and results so minutely given, that the work becomes one of reference rather than a book to be read sequentially. The whole consists of four parts. The first dealing with bacteriology, the second with immunology, the third with serum treatment, preventive and curative, and the fourth summarizing the conclusions and giving a bibliography of more than two hundred references. Appended are 38 photomicrographs, as clear as reproduced rickettsial photographs ever are.

In part I, the author deals with cultivation of Rickettsia and discusses various factors entering into and influencing the culture—medium, temperature, use of fresh or dead tissues—and the biological aspects of *R. prowazeki* in tissue culture—morphology, staining, colony formation, filtrability, virulence, etc. A new method of staining is described. The following is the technique :—

Solution 1. Saturated solution of basic fuschsin in absolute alcohol.
Solution 2. Two per cent. thionin in distilled water.
Solution 3. Buffer solution of monopotassium (1 per cent.) and disodium phosphate (25 per cent.) with *p*H 7·4–7·6.
Solution 4. 0·5 per cent. citric acid.

From these are prepared :—

I. 0·1 cc. of solution 1 added to 25 cc. of solution 3, and filtered. This is unstable.

II. 25 cc. of solution 4 are added to 75 cc. distilled water and 0·5 cc. of solution 2, and filtered. This keeps permanently.

Procedure.—Smears of culture or organs or exudate containing Rickettsia, even and thin, are stained for 3–5 minutes with the 0·25–1 per cent. basic fuchsin in the buffer solution or distilled water ; the stain is filtered directly on to the slide. Decolorization is obtained by 2–3 seconds' exposure to the citric acid solution (if longer, the Rickettsia lose stain). Counter-staining is done with carbol methylene blue diluted to 1 in 4 and allowed to act for 1–2 seconds.

The results as judged by coloured plates reproduced are very clear.

In part II vaccination against murine and the European types of typhus is discussed. The technique of Zinsser and Castañeda's vaccine is described, the results of animal experimentation carried out with it, and the possibility of preparing this vaccine in Chile is discussed. Analogously, the manufacture and use of a culture vaccine for European typhus is considered. Employing Zinsser's technique and large flasks he is able to obtain a sufficient quantity of Rickettsia. It has proved effective in animal experiments with the guineapig, and the author states that there is no danger of injecting the living virus and the product should be tested in man. There follow several protocols on the results of sero-vaccination of guineapigs against infection by the European type.

Part III, as stated, deals with preventive and curative therapy. In one table is a record of 70 contacts receiving the Harvard anti-murine serum, prepared by ZINSSER and CASTAÑEDA, and none of them contracted the disease. In the curative section, a few cases only of the European type are recorded. The treatment appeared to shorten the fever, lower the temperature and favourably influence the toxic and nervous symptoms but seemed not to affect the evolution of the physical signs present. The book is a valuable record of work meticulously performed. *H. H. S.*

MAJUMDAR (Akhil Ranjan) [M.B., Bengal Medical Service, etc.]. **Bed-Side Medicine. A Hand-Book of Medical Diagnosis including Symptomatology, Physical Signs, Pathology, Treatment and Laboratory Methods, from Tropical Standpoint.** Fourth Edition.—pp. xii+939. With 259 text figs. & 49 figs. on 26 plates. 1938. Calcutta : The Book Company, Ltd., 4/4A College Square. [8 Rupees 8 Annas.]

The aim of this book appears to be to describe in a single volume those facts of medicine, clinical pathology and treatment which enable the student or practitioner to examine patients intelligently, to arrive at an accurate diagnosis and to prescribe adequate and rational treatment. The author states that he has tried his utmost to keep the material within the confines of a handy volume which can be carried about in routine work, and he is fully aware that this may have led to omissions. Some of these omissions are not without importance, especially to the workers in the tropics. For example, yellow fever is described as endemic in tropical America but no mention is made of its presence in Africa ; undulant fever is said to be "centred in Malta", and in India " is sometimes seen in the Punjab among troops recently

arrived from the Mediterranean Coasts," while there is no mention of species of *Brucella* other than *melitensis* ; the virus of climatic bubo appears unaccepted, Frei's test is ignored and scant attention is paid to the less obvious manifestations of the infection ; there is no recognition of the effect of sulphonamide drugs in *Bact. coli* urinary infections or in gonorrhoea, which disease does not even appear in the terminal index. The book has increased in volume but whether such an increase is inevitable is doubtful. Pages might have been saved by the suppression of statements which rest upon little foundation of experimental or practical experience. For example, where is the evidence that in blackwater fever the " actual process is one of lowered resistance of the red blood cells to the osmatic (*sic*) tension, causing their rupture and haemolysis " ; and who would agree that organic arsenical drugs are specific curative agents for filarial disease ?

Nevertheless, the fundamental excellence of the book has been favourably commented upon in previous reviews (see this *Bulletin*, 1935, Vol. 32, p. 464, and 1931, Vol. 28, p. 336) and the early appearance of the fourth edition is sufficient indication of the value placed upon the work by its readers. The present edition, which is well illustrated by diagrams, photographs and illustrations, will probably prove equally popular, particularly in India for which country it is especially designed. *F. Murgatroyd.*

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